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ABSTRACT

The study reported in this document attempted to determine the effect of population growth on education costs in developing countries, given various assumptions as to the future trend of fertility and mortality. The population factor was examined along with other factors influencing educational costs, such as the improvement of enrollment ratios, the need for a qualitative improvement in the educational system, and the long term trends of the unit costs of education systems. Comparison of these factors, it was hoped, would provide data helpful to educational planners in deciding on an educational development policy to be followed. In order to ascertain more precisely the possible effects of these factors on educational costs, four national case studies were made in Ceylon, Colombia, Tanzania, and Tunisia. These case studies, limited to first-level education and teacher training, were conducted on a standard pattern to allow for a comparative analysis. Each case study is reported in a separate chapter, and two other sections of the document contain a synthesis report of the case studies and a model that shows the effect of demographic growth on the development and cost of first-level education and teacher training. (Author/DN)

ED 082333

Population growth and costs of education in developing countries

Ta Ngoc Châu

With contributions by Françoise Caillods, Jacques Hallak *and* Claude Tibi

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Preface

The continuance over the last twenty-five years of a high fertility rate, and of a rapid fall in mortality, more particularly in infant mortality, has led to a rapid population growth in the developing countries. As a result of this trend the younger age groups occupy a predominant place in the age pyramid. The relative size of the young population group and its steady growth mean that schooling in these countries can be provided only at the cost of an effort proportionately much greater than that made by industrialized countries, which have different population characteristics.

Population expansion is beyond question a preponderant factor in the future growth of education costs. It is not the sole factor, but nevertheless cumulates the effects of other factors such as:

(a) the improvement of enrolment ratios, with a view, for example, to universal first-level schooling;

(b) the need for a qualitative improvement in the education system implying an improvement in the retention rate and in teacher qualifications;

(c) the long term trends of the unit costs of education systems and, in particular, of salary costs.

One of the valuable features of the survey made by the International Institute for Educational Planning, under the direction of Mr. Ta Ngoc Châu, is precisely that it tries to isolate each of these factors. In doing this, it brings out—and this is its main purpose—the effect on education costs of population growth given various assumptions as to the future trend of fertility and mortality. At the same time, this factor is set in a more general context within which its relative importance can be assessed. The comparison of the various factors in cost increases and their respective weight offers a considerable number of pointers as to the educational development policy to be followed. It demonstrates the considerable effort which will have to be made in order to extend and improve education under conditions of rapid population growth.

Another original feature of this study is that it is based on concrete situations. The conclusions are in fact founded on four national case studies carried out in Ceylon, Colombia, Tanzania and Tunisia. These case studies, conducted on a standard pattern, have allowed a comparative analysis. This analysis shows a very great diversity of situations, both in relative terms, i.e. in the comparison of the present situation with that in 1989, and in absolute terms, that is to say, in the assessment of the effort to be made by each of these four countries in the horizon year.

If we take the intermediate population growth assumption, the recurrent costs of first-level education in 1989 compared with present costs, will be multiplied by 3.4 in Ceylon, 4.2 in Tunisia, 4.8 in Colombia and by 8 in Tanzania. These wide differences are partly due to a different population trend, but they are also due to the trend between the base year and the horizon year of a certain number of variables, the most important of which are the intake rate, the retention rate, the percentage of qualified teachers, and the average level of salaries.

The diversity of the situation also becomes manifest when one tries to assess the effort which these countries must make to attain the same end, namely universal first-level schooling. If this effort is assessed in terms of the percentage of gross domestic product (GDP) to be devoted to education in the horizon year, it is found that this percentage (always on the intermediate population growth assumption), which is only 2.4 per cent for Ceylon, amounts to 4.1 per cent for Tunisia and 5.4 per cent for Tanzania. The main variables which explain these differences are the ratio of school-age population to working-age population, the average real length of first-level schooling (which is different from the official length because of repeating and drop-out) and above all, the relation between the average salary of teachers and the GDP per person of working age.

Whatever may be the differences found in the relative weight of the growth of the school-age population in the rise of educational expenditure, it emerges clearly from the comparison of the three population growth assumptions used in the case studies that population trends constitute one of the fundamental consequences of the population policy followed by the countries studied; it is clear that a slowdown in the growth rate of the young population group, combined over the same period with an increase in the population of working age, would diminish the financial burden of schooling and would encourage the establishment of first-level schooling for all, which is at present so ardently desired.

The four case studies, carried out by Messrs J. Hallak, C. Tibi and Ta Ngoc Châu and Miss Françoise Caillods, have been the subject of a synthesis report written by Mr. Ta Ngoc Châu, the general content of which I have briefly commented upon. This report does not in any way exhaust the subject, since it would have been preferable to have a wider sample of case studies. The Institute intends to go further along these lines, and thanks to the financial aid of the Ford Foundation two further national case studies are at present being carried out on the Ivory Coast and on Ghana; while we do not wish to multiply this type of study to any great extent, we hope that they will be followed by two others, so as to arrive at a harmonious geographic distribution and to draw conclusions which would better represent the variety of situations.

Preface

The results of the first work by the IIEP are, in themselves, sufficiently important to be submitted here and now to the attention of national policy-makers in the fields of population and education and of all specialists in these questions.

I should like to express my gratitude to the Population Council of New York which has been kind enough to provide the IIEP with the finance needed to embark on this new line of research and whose own experience in this matter and enlightened counsels have been invaluable to us in organizing and carrying out this work. My thanks are also due to the Swedish International Development Agency which also helped to finance this research.

RAYMOND POIGNANT
Director, IIEP

Contents

A synthesis report of four country case studies
Ta Ngoc Châu 11

Ceylon: a case study
Jacques Hallak 75

Colombia: a case study
Ta Ngoc Châu and Françoise Caillods 119

Tanzania: a case study
Ta Ngoc Châu and Françoise Caillods 175

Tunisia: a case study
Claude Tibi 227

Model showing the effect of demographic growth on the development and cost of first-level education and teacher training
Ta Ngoc Châu 279

3/9

A synthesis report of four country case studies

Ta Ngoc Châu

10/11

Contents

Summary and conclusion 13

I. Population growth 19

II. The effect of population growth on first-level enrolments and teacher needs . . 28
The growth of first-level enrolments 28
Projection of teacher needs 38

III. The effects of population growth on the cost of first-level education and teacher training 44
Projection of the recurrent costs of first-level education 44
Projection of capital costs 50
Projection of teacher-training costs 52
Total cost of first-level education and teacher training 53

IV. The effect of population growth on the effort needed to develop first-level education 57
The growth of recurrent costs of first-level education from the base year to the horizon year 57
Trend of the proportion of GDP devoted to first-level education costs 61

Appendixes 69

Summary and conclusion

Over the last two decades education costs in the developing countries have increased rapidly and their proportion both of the budget and of GDP[1] has tended to grow. This growth has been the result either of the pressure of private demand or of concerted government policy designed, for example, to attain within a given period of time universal first-level education. For all these reasons a steadily increasing proportion of a given age group enters the various levels of education.

Underlying this improved access to education (measured by the proportion of an age group enrolled) there is also population growth, which compounds the problem. The effect of this population growth, however, is more or less direct and more or less immediate, according to the degree of educational development and depending on the level of education.

At the first-level, for example, if it is assumed that admission is normally at the age of 6 and that the average duration of first-level education is seven years, and if no allowance is made for late entries (which may be very substantial in certain countries), it can be said that total first-level enrolments at any given date depend on the trend over the previous seven years of:

(a) the sub-population of children aged 6;

(b) the intake rate of these children into first-level education;

(c) the retention rates in the system.

The influence of population growth is therefore limited to the intake stage and total enrolments ultimately depend on the behaviour and characteristics of the system.

In order to ascertain more precisely the possible effects of population growth on educational development and costs, four national case studies have been carried out on Ceylon, Colombia, Tanzania and Tunisia. These four countries were chosen in order to have a wide geographical distribution and to be able to obtain relatively satisfactory data on future population growth and educational costs.

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1. GDP: gross domestic product

The experience of each of these countries is, of course, interesting in itself, but from the point of view of this study what is particularly useful is the possibility of making a comparative analysis. For this reason the first stage of the research was devoted to working out a common method which could be applied to all case studies. Although four authors took part in drafting the different case studies, the same method, with a few variations, has been used throughout.

For three reasons these studies are limited to first-level education and teacher training.

The first reason is that, while the aim of most countries is to arrive sooner or later at universal first-level education, access to second-level education may be limited. In Tanzania, for example, the growth of second-level enrolment follows the trend of manpower needs. For this reason the planned increase in second-level entries is well below the figure of first-level school leavers, and under present plans, the rate of transition from first- to second-level education, which was already very low in 1968 (13.4 per cent) will have to fall even further (to 5.9 per cent) in 1979. In the light of this possible limitation of access to second-level education, the full effect of population growth is not felt at the second-level. In other words, the increase in second-level enrolment is dependent more on the government's educational policy than on the trend of the population.

The second reason is that in many developing countries the costs of first-level education and teacher training already absorb half, and in certain cases more than half, of the total cost of education. That is why, even if the analysis is limited to these two levels, it is possible to have a fairly precise idea of the effect of population growth on future educational costs.

The third and last reason is that, given the age of entry into second-level education and the duration of second-level schooling, any change in the present population trend, such as a fall in fertility, would only take full effect on second-level enrolment in eighteen to twenty years' time. Changes in population trends come about gradually and their effects are felt only after an interval—say ten years or so. To ascertain the repercussions of various assumptions about the fall in fertility on second-level enrolment, very long term projections must be made with a time horizon of the year 2000. In making such projections one obviously runs the risk of adopting unrealistic assumptions, and all the more so since both the organization and the content of second-level education may change completely in the meantime.

These case studies cannot be treated as estimates of future educational expenditure. Where government targets exist and are clearly defined (as in Tanzania) it is these targets which have been used. In their absence, assumptions have been made. In any event, various alternatives have been taken for the trend of the qualification profile of teachers, pupil/teacher ratio, teacher's salary scales and, more generally, educational costs. These alternatives or sets of alternatives are not related to any probable or desirable trend of educational policy. The case studies are of interest in that they show not the probable level of costs but the sensitivity of educational costs to different assumptions of population growth according to the policy chosen.

Finally, it has not been possible for these case studies to take into account possible changes in the technology of education. This does not mean that we underestimate the importance of the question or that we overlook the benefits which developing countries may derive from educational innovations. Available information on the use of new media in teaching relates only to limited experiments and it is difficult to forecast the level of costs when their application has become general.[1] To the best of our knowledge, apart from the Samoa Islands which are relatively small, there is only one instance in which educational television will be generalized for all first-level classes. This project in the Ivory Coast,[2] however, has only just been started.

Furthermore, in the countries selected for this research, while tentative reforms are being introduced with a view to adapting the content of education to the characteristics and needs of the country and in particular to the needs of rural areas, there are no plans or projects for a radical change in the methods and structures of first-level education. It would obviously be going beyond the scope of the present study to explore the possibilities of applying new teaching techniques in these countries and to estimate their repercussion on costs.

Population data of developing countries are, in general, imprecise. Fertility and mortality are often measured indirectly and on the basis of incomplete data.

The future trend of fertility depends on a number of factors and it is always hazardous to try to predict it. No doubt assumptions can be made about it in the light of the present level of fertility, the attitude of the government towards population growth and the possible reaction of individuals. The difference between these assumptions may indicate the degree of success of population policy. In Ceylon and Tunisia the difference is very great and the population projections are also very different. In Tanzania, in the absence of any clearly defined population policy, fertility is assumed to remain at its present level, and the differences between the three population projections are relatively slight, their only variation resulting from the more or less rapid fall in mortality. The cost increase estimated for Tanzania must therefore be interpreted as being that which would result if no population policy were applied.

The differential effect of the various population projections on the school-age population and consequently on the cost of education depends solely on the difference between the assumptions made. It is nevertheless valuable to analyse this effect, since it indicates that the achievement of the same objective, namely universal first-level education, may call for relatively different efforts according to the future trend of fertility.

Although the choice of countries was mainly guided by the reasons indicated above, it also allowed us to cover a fairly wide variety of situations. It is this

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1. See W. Schramm et al, *The new media: memo to educational planners*, Paris, Unesco: IIEP, 1967.
2. See Ta Ngoc Châu, 'Ivory Coast: the cost of introducing a reform in primary education', in *Educational cost analysis in action: case studies for planners*, Vol. II, Paris, Unesco: IIEP, 1972.

variety which we should first like to emphasize. We shall then identify the variables which play an important part in the increase in costs.

It is possible to estimate the effect of population growth on educational costs in two different ways. The first is to calculate the cost increase between the base year and the horizon year, trying to isolate that part of the increase which is attributable to population growth. The second is to limit oneself to the horizon year and to compare the effort required to develop first-level education (expressed, for example, in terms of percentage of GDP allocated to first-level education and teacher training) for the various assumptions of population growth.

When one tries to isolate the role of population growth in the increase of total costs, one finds that this share differs widely both between the different population projections in the same country and between countries.

In Ceylon, for example, on the low assumption, the cost increase accounted for by population growth is nil in the sense that with the assumed rapid fall in fertility the school-age population will be practically the same in 1989 as in 1968. In contrast, on the high assumption, the school-age population will be multiplied by 1.6. This possible difference in the increase of the school-age population indicates the magnitude of the incidence of a future fall in fertility on the level of educational costs. In Tanzania, where it has been assumed that fertility will remain at its present level, the increase in the school-age population will be greater; it will be multiplied by 1.8 or 2.0 according to the projection.

Population growth, however, is not the only factor in the increase of total costs. In Ceylon, even on the low assumption, where the increase in the school population is nil, costs will nevertheless be multiplied by 2.7. On the high assumption they will be multiplied by 4.0. This increase will be even higher in Tanzania since costs at the horizon year will rise to 7.5 or 8.4 times their level in the base year, according to the population assumption adopted. These figures speak for themselves and it seems needless to stress the magnitude of the efforts to be made.

In addition to population growth, the factors which may influence the increase of costs may be grouped in three main categories: factors connected with the present level of educational development (measured for example, by the intake rate); factors connected with the qualitative aspects of that education (as shown by the qualification profile of teachers, the pupil/teacher ratio, or indirectly by the wastage rate of the system) and possible future improvements; factors connected with the effect of economic growth on the average level of teachers' salaries.

The time and effort required to achieve universal first-level education differs greatly from country to country. Whereas in Colombia, owing to late entries, new entries are well above the admission-age population, in Tanzania they amount to barely half, and the effect of the gradual increase of the intake rate on the increase of costs is even greater than that of population growth (even on the high assumption). In Tanzania, it is above all this increase in the intake rate which accounts for the considerable increase in costs over the next two decades.

The present situation of education in the countries studied, in respect of the qualification profile of teachers, the pupil/teacher ratio and expenditure allocated to teaching materials, is not always satisfactory, and various assumptions have been made as to its improvement. The situation, of course, differs from country to country and the incidence of this improvement on total costs varies. It is particularly marked in Colombia, where the percentage of insufficiently qualified teachers is high and where drop-out of pupils is considerable in rural areas.

If one assumes, as we have done, that salary scales will grow at the same rate as GDP per person of working age, the effect of economic growth on cost increases may also be fairly substantial in cases where economic growth may be faster than the increase of the working-age population.

Instead of measuring the effort needed to develop first-level education in terms of the cost increase from the base year to the horizon year, one can also measure it by calculating the proportion of GDP which should be allocated to this expenditure in the horizon year. Various alternatives have been adopted for future economic growth, but in view of the importance of salary costs in total costs and of the assumption adopted for the trend of salary scales, the proportion of costs to GDP does not change very much with the rate of economic growth. A faster economic growth, because of its effect on teachers' salaries, will lead to a faster growth of salary costs. Conversely, a slower economic growth will lead to a slower growth of salary costs.

The proportion of first-level education costs to GDP varies, of course, according to population projections, but also to the situations of the various countries. Here again, the two extreme cases are Ceylon and Tanzania.

In Ceylon, on the low population assumption, this proportion will be only 1.9 per cent in 1989, that is to say slightly less than at present, despite various improvements which have been assumed. On the high assumption, however, it will amount to 2.8 per cent or a difference of 47 per cent. This difference is mainly explained by the fact that the fall in the fertility rate, at a given date, does not have the same effect on the numbers in the different age groups. Over the next twenty years its fall will greatly affect the first-level school-age population, but will have very little effect on the working-age population.

In Tanzania the proportion of GDP which must be assigned to first-level education in 1989 amounts to between 5 and 5.6 per cent. There is therefore a wide difference compared with Ceylon, although the target of universal first-level education is common to both countries. A detailed analysis of the different variables which may influence this proportion of the GDP is made in the study itself. It is however worth mentioning that, in comparing the situation of Ceylon and Tanzania in the horizon year, two variables are particularly significant.

The first is the proportion of admission-age population to working-age population. This variable is purely demographic in character. It depends on the distribution by age of the population. At present the proportion is 5.3 per cent in Ceylon and 5.5 per cent in Tanzania. This difference will, however, become more pronounced in the future according to the population assumption adopted. It may fall to 3.0 per cent in Ceylon on the low population assumption (or only 5 per cent on the high assumption). In Tanzania the situation is different, since, for reasons which we have already indicated, it is assumed that the present fertility level will be maintained in the future. It follows that this variable, instead of falling, will increase slightly as a result of the differential fall in mortality by age groups. In any event, its level will remain high (5.6 per cent on the low assumption and 6.5 per cent on the high).

The second variable is the ratio between average teachers' salaries and GDP per person of working age. This ratio depends on a number of factors. It depends in particular on the country's level of economic development and the degree of educational development. It also depends on salary policy for civil servants and more particularly for teachers. At present it varies in the relation of one to three (1.74 in Ceylon and 5.43 in Tanzania). It is the projected value of these two variables in the horizon year which explains both the difference in the proportion of GDP allocated to first-level education on the two extreme assumptions in Ceylon, and the wide disparity between the situation of Ceylon and that of Tanzania.

The above are the main conclusions which can be drawn from the case studies. In order to analyse them in greater detail, we shall look successively at population growth; its effect on the increase of enrolment and teacher needs; its effect on the growth of first-level education and teacher training; and finally, the trend of the proportion of GDP which is to be allocated to these costs.

I Population growth

Population data of developing countries are generally imprecise. Fertility and death rates are always measured indirectly on the basis of incomplete data. Population projections, moreover, are based on various assumptions as to the future level of fertility and mortality. They cannot therefore be regarded as forecasts. In fact they are merely conditional projections and indicate what the trend of the population might be if one of these sets of assumptions were to be realized. It is in this sense that the projections given below should be interpreted.[1]

From the point of view of total population, the four countries chosen for these studies are fairly comparable. Ceylon and Tanzania have a population of about twelve million; Tunisia, on the other hand, has a smaller population and Colombia a larger one.[2]

The age structure of the population of these four countries is also comparable, as shown by figure 1, in which France has been included to give some idea of the situation in the industrialized countries. This age structure is marked by the high proportion of young people. The population under 20 accounts for more than half the total population and the median age varies from 16.6 in Colombia to 19.7 in Ceylon.[3]

As a result, the proportion of the school-age population to the active population is high. It is, however, difficult to estimate precisely the relationship between the two. The number of late entries and repeaters in certain countries make it impossible to define the school-age population in the strict sense. Similarly, the definition of active population varies from country to country (particularly with regard to female and agricultural labour) and wide divergences in activity rates are found, even for countries with comparable economic structures. That is why, in table 1, to compare the situation of the four countries chosen and that of an industrialized country, we have preferred to take the population from 5 to

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[1] See Ta Ngoc Châu, *Demographic aspects of educational planning*, Paris, Unesco: IIEP, 1969 (Fundamentals of educational planning, 9).

[2] Tunisia (1966), population 4,533,000; Ceylon (1968), population 11,975,000; Tanzania (1967), population 12,259,000; Colombia (1968), population 19,829,000.

[3] The median age is the age which divides the population into two equal parts. By way of indication, it may be noted that the median age in France was 32.4 in 1970.

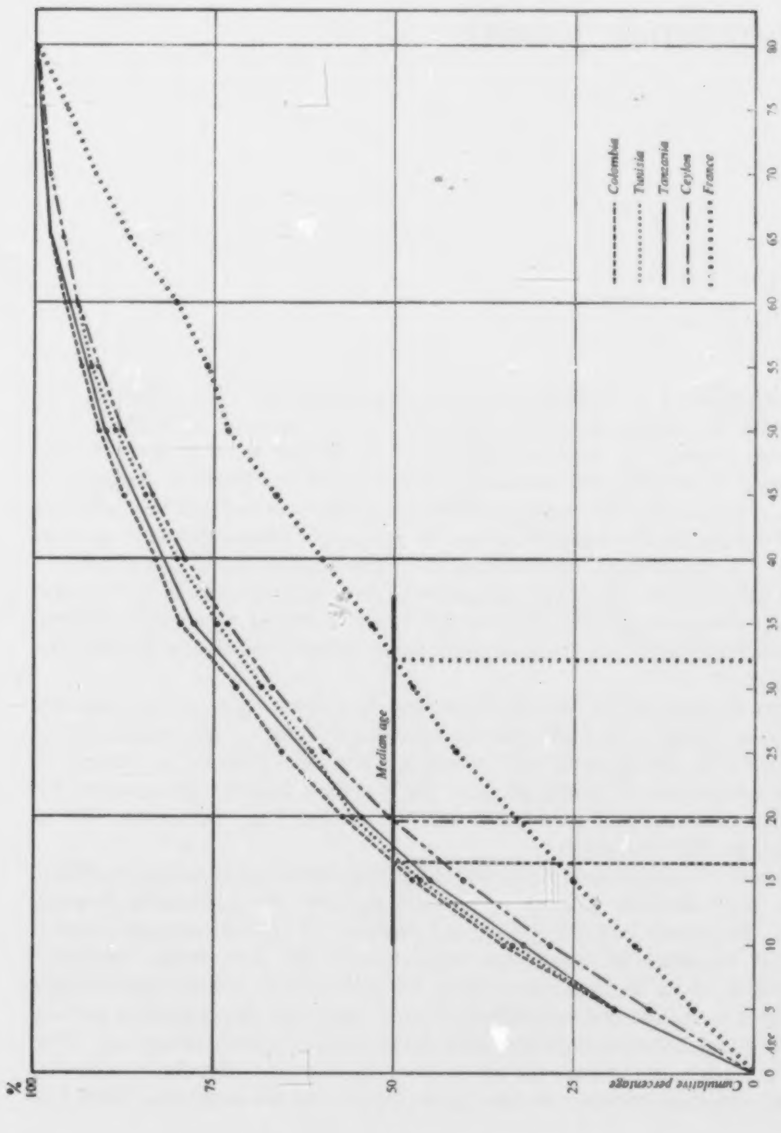

FIGURE 1. *Comparative age structure of the population*

14 as an approximate measure of the school-age population, and that from 15 to 59 as an approximate measure of the active population.

TABLE 1. School-age population and working-age population (in thousands)

Country	Population 5-14 (a)	Population 15-59 (b)	(a) as percentage of (b)
Tunisia	1 292	2 222	58.1
Colombia	5 255	9 115	57.7
Tanzania	3 244	6 218	52.2
Ceylon	3 078	6 454	47.7
France [1]	8 371	28 874	29.0

[1] The figures for France are given simply to give an idea of the situation in industrialized countries.

SOURCE Tunisia: D.B. Johnson, *Population of Tunisia, estimates and projections, 1967-2000*, Washington, US Bureau of Census 1971.

Tanzania: The United Republic of Tanzania, *Provisional estimates of fertility, mortality and population growth for Tanzania*, Dar-es-Salaam, 1969.

Colombia: CELADE, *Boletín demográfico*, Santiago de Chile, 1969, (Ano 2, Vol. III)

Ceylon: S. Selnaratnam, N. Wright and G. Jones, *Population projections for Ceylon, 1968-98*, Colombo, Ministry of Planning and Economic Affairs, 1970.

France: R. Pressat, 'La conjoncture démographique. La France.' in *Population*, March-April, 1970, Paris, Institut National d'Etudes Démographiques

In these four countries the birth rate is generally fairly high. With the exception of Ceylon, the crude birth rate amounts to around 45 per thousand. Substantial differences are, however, to be found in the death rate (table 2).

TABLE 2. Crude birth rate and death rate, and natural growth rate

Country	Crude birth rate (per thousand)	Crude death rate (per thousand)	Natural growth rate (per thousand)
Tanzania (1967)	47.0	22.0	25.0
Tunisia (1967)	43.6	16.3	27.3
Colombia (1968)	44.6	10.6	34.0
Ceylon (1968)	32.2	7.1	25.1

SOURCE See table 1.

It is in Colombia that the population growth is highest, although the crude birth rate is slightly lower there than the rate observed in Tanzania. The death rate in Colombia has gradually fallen in the past and is now relatively low. Ceylon stands rather apart from the three other countries since both the birth rate and the death rate are lower.

The crude birth rate and death rate, however, are closely dependent on the distribution of the population by age and sex. They do not therefore provide an adequate measurement when comparing countries with different population structures.[1] In such a case, the gross reproduction rate and the expectation of life at birth given in table 3 may be better indicators.[2]

TABLE 3. Crude reproduction rate and expectation of life in the four countries considered

	Tunisia	Tanzania	Colombia	Ceylon
Gross reproduction rate	3.60	3.20	3.20	2.60
Life expectancy	52	43	58	60

SOURCE See table 1.

These figures confirm to some extent what we have already noted with regard to the crude birth rate and death rate. It seems, however, that it is Tunisia which has the highest fertility rate of the four countries considered.

The population projections used in these four studies have not been made by the IIEP. They come from various sources. The projections for Tanzania were made by the United Nations Population Division, those for Colombia by the Latin American Centre for Demographic Studies, those for Tunisia by the International Demographic Statistics Centre, and finally, those for Ceylon by the Ministry of Planning and Economic Affairs.[3] They are based on data of censuses taken at various dates in the past (1963 for Ceylon, 1964 for Colombia, 1966 for Tunisia and 1967 for Tanzania). They are based on various assumptions as to the future population trend.[4]

With regard to mortality, the different projections are based on a gradual fall. For Tanzania, three variants have been taken. For the other countries, only one assumption was made. In general, the expectation of life at birth adopted for 1990 is high, reaching or exceeding the age of 65.[5]

With regard to fertility, the range of assumptions is wider. These different assumptions, expressed in the form of gross reproduction rate, are shown in

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[1] In the four countries selected this structure is fairly comparable.

[2] The gross reproduction rate indicates the average number of female births per woman during the period of fertility, disregarding the effect of mortality during that period. The expectation of life is the average number of years lived by a member of a fictitious cohort with the same mortality by age as that observed in the population considered. For fuller details, see Ta Ngoc Châu, *The demographic aspects of educational planning*, op. cit.

[3] Tanzania: United Nations Population Division, *Projection of the population of Tanzania, 1965-85*, unpublished document. Colombia: J. Arevalo, and A. Ortega, *Colombia: Proyecciones de población por sexo y grupo de edades, 1965-2000*, Santiago de Chile, CELADE, 1968. Ceylon: S. Selnaratnam, N. Wright and G. Jones, op. cit. Tunisia: D.B. Johnson, *Population of Tunisia: estimates and projections, 1967-2000*, op. cit.

[4] Details of the different population assumptions made will be found in appendix A, table 1.

[5] Except for Tanzania.

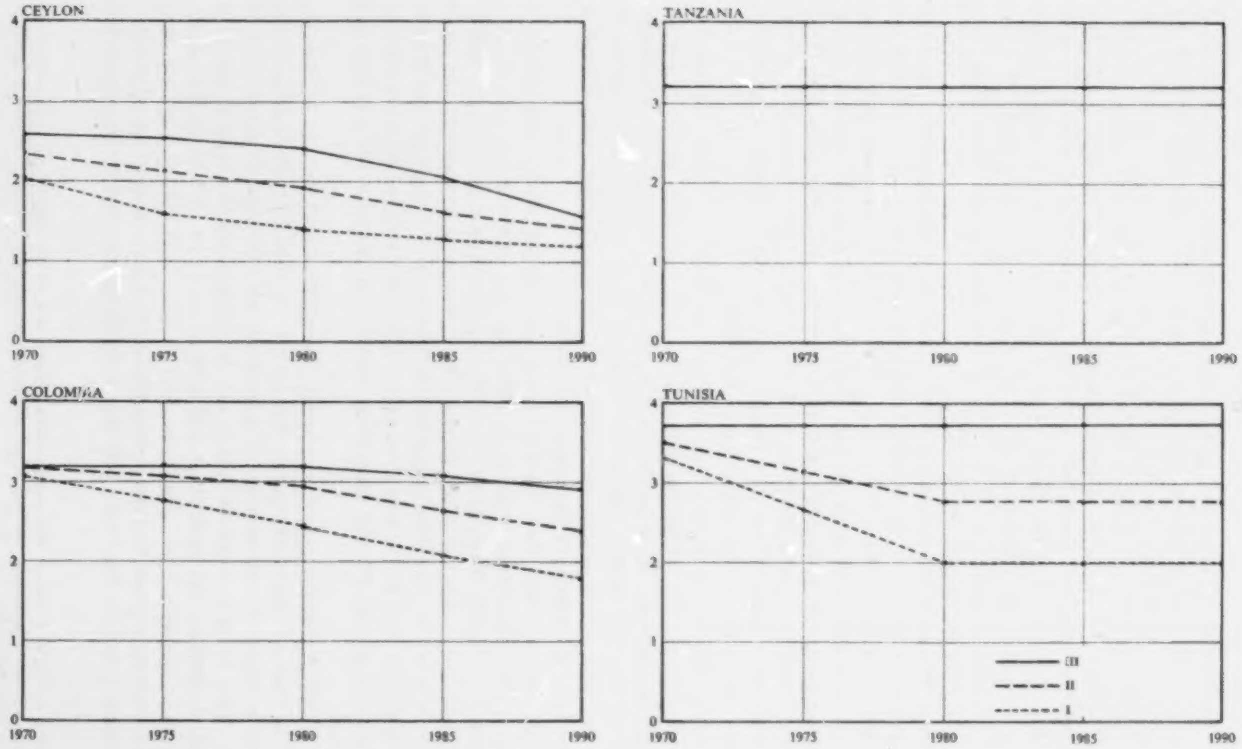

FIGURE 2. *Trend of gross reproduction rate under the various population projections*

figure 2. In the case of Tanzania, it has been assumed that the present level of fertility will be maintained for the next fifteen years. The difference between the three population projections for this country therefore arises solely out of the different fall in mortality. A constant fertility is also adopted for the high assumption for Tunisia. On the two other assumption, however, fertility should fall, but will become stabilized from 1980 onwards. A steady fall in fertility is also assumed for Colombia, but this fall is more or less accentuated according to the projection. Finally, the three projections for Ceylon all assume that the gross reproduction rate will fall to 1.2 in 1998. What distinguishes them from each other in this case is the pace of this fall.

The fall in fertility has a different effect on the school-age population and the working-age population. If we consider only the next twenty years, we can say that the fall in fertility will have very little effect on the working-age population. The people who will be between 20 and 59 in 1990 are already born and out of the whole working-age population, any fall in fertility will only affect the 15-19 age group. In other words, the growth of the working-age population over the next twenty years depends on past fertility and the future trend of mortality. It depends very little on the future trend of fertility.

Conversely, the fall in fertility and the pace at which it occurs will have a strong influence on the school-age population, and especially on the first-level school-age population. As a result the growth in the working-age population (always over the next twenty years) will follow more or less the same rate as at present, but that of the school-age population, on the contrary, may follow a much lower rate. Figure 3 illustrates this point.[1]

It will further be noted that the differences between the three projections are greater for the school-age population than for the working-age population. The situation is slightly different in Tanzania, since fertility is assumed to remain at its present level. But the effect of the fall in mortality operates in the same direction. The fall in mortality, in general, is greater for the younger age groups than for the older and that is why, here again, the differences between the various projections are greater for the school-age population than for the working-age population.

Since a fall in fertility rate has a more immediate effect on the school-age population than on the working-age population, we find that, at least over the next twenty years, the percentage of school-age to working-age population is reduced. This trend is shown in figure 4.[2] In Ceylon, on the assumption of a rapid fall in fertility, this percentage will drop from 47 in 1970 to 29.3 in 1990. Similarly, in Colombia it will drop from 58.1 to 44.1. It is only in Tanzania that this rate will increase from 51.7 per cent to 52.5 or 56.7 according to the projection. This increase is mainly due to the fact that it has been assumed in the population

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[1] Appendix A, table 2 shows the comparative growth rate of the school-age population and the working-age population in the four countries during the different five-year periods between 1970 and 1990.

[2] Appendix A, table 3 gives the figures from which this graph was constructed.

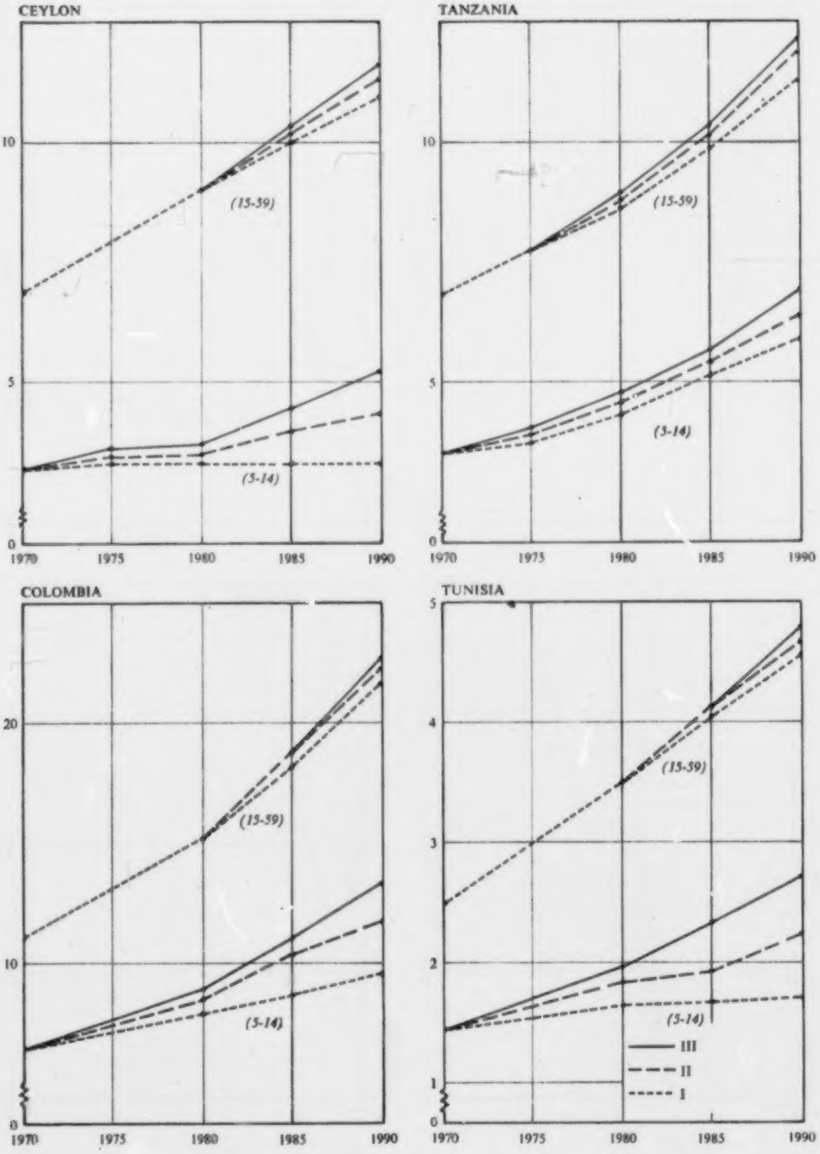

Figure 3. *Comparative growth of school-age population (5-14) and working-age population (15-59), in millions*

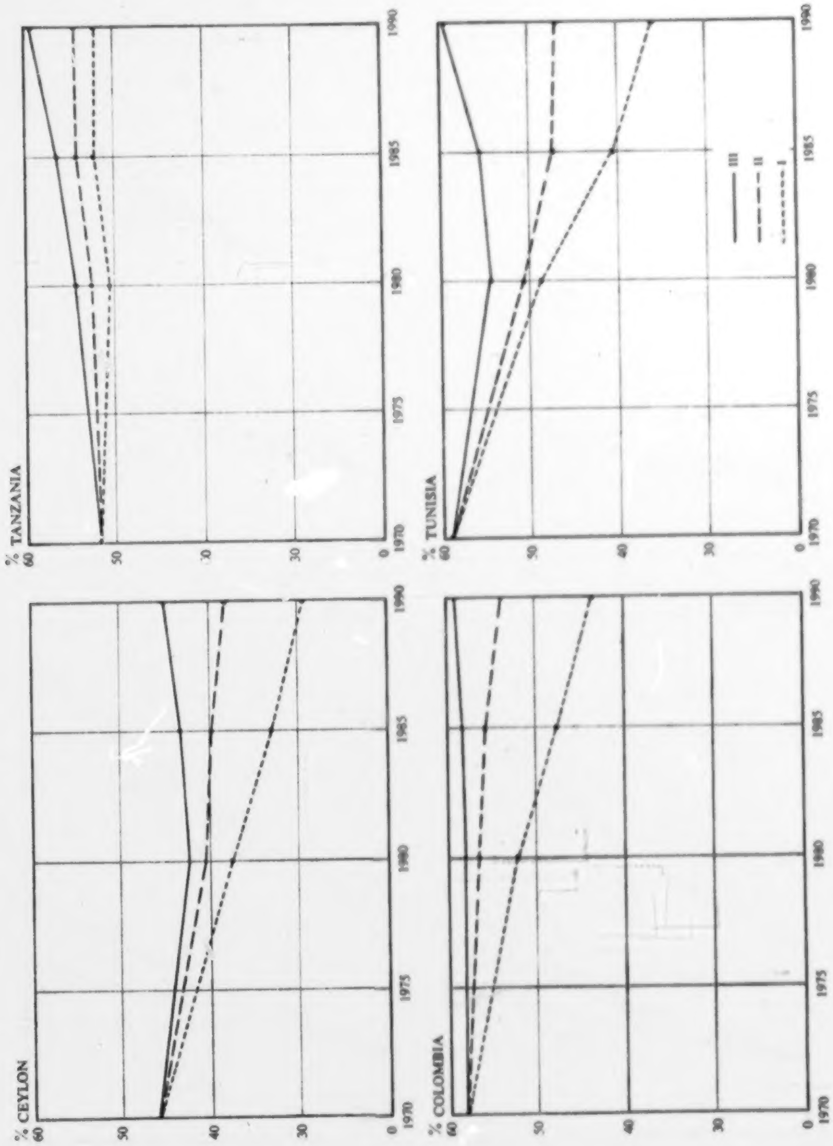

FIGURE 4. *School-age population as percentage of working-age population*

projections for Tanzania that fertility will remain at its present level. Furthermore, as we have indicated, the effect of the fall in mortality is greater for the younger age groups than for the older ones and has the effect of slightly increasing the proportion of school-age population.

In so far as educational costs are 'levied' on the production of the active population, the proportion of school-age population (defined here as the population liable to compulsory education) to the active population, may be taken as an indicator of the effort needed to establish universal first-level education.

In the above calculations we have related the population of 5 to 14 and the population of 15 to 59. It is true that the population from 5 to 14 does not constitute the school-age population and that the population from 15 to 59 does not really represent the active population. But for the reasons already given and in particular to allow comparison between countries, we have preferred to use this rough indicator rather than a finer one, or one which seems to be finer. In any event, rough as it is, this indicator does give an idea of the effort needed.

In this connexion, it is interesting to compare the situation of Ceylon with that of Tanzania. In Ceylon the level of fertility is already comparatively low and is expected to fall further. In Tanzania where the level of fertility is higher, it is assumed that it will be maintained at its present level over the next fifteen years. What will be the real trend of fertility? That is a question to which it is difficult to give a precise answer, in view of the complexity of the problem. It may be anticipated that the population projections on which these case studies are based constitute boundary limits and that population growth in the four countries considered will lie between the two extreme projections. If this is true, taking the extreme cases, it can be said that in 1990 the proportion of school-age population to working-age population might be nearly twice as great in Tanzania as in Ceylon (56.7 per cent and 29.3 per cent respectively). This means that the same target of universal compulsory first-level education may require a very different effort in these two countries.

II The effect of population growth on first-level enrolments and teacher needs

We shall look first at the effect of population growth on the growth of first-level enrolments and then at its impact on teacher needs in the light of an improved staffing formula and the qualification profile of the teaching force.

The growth of first-level enrolment

The method used in the case studies for the projection of enrolment is based on one important variable: new entries into the system. As we have noted, these entries constitute the only direct link between population growth and first-level enrolment. Once admitted into the system, the behaviour of the cohorts of pupils is dictated by the characteristics of the education system and does not depend directly on demographic data.[1]

The modal age of admission into first-level education is 6 in Ceylon and Tunisia and 7 in Colombia and Tanzania. The trend of the number of children attaining admission age depends closely on the future trend of fertility. It varies enormously according to the country and according to the projections. Figure 5 shows the growth in the number of these children in the four countries over the next twenty years.

It will be noted that the differences between the three population projections are relatively slight for Tanzania, for the reasons previously given. In the other countries, however, the differences are much wider. The effect of the fall in future fertility on the trend of admission-age population is particularly evident when the growth rates are compared as in table 4. They vary from nil for Ceylon on the low assumption to 3.7 per cent for Tunisia and Colombia on the high assumption.

[1] This would not be the case if education were compulsory for a given age bracket, but although the countries analysed have arrived at universal admission or are moving in that direction, they are still a long way from compulsory education in the strict sense.

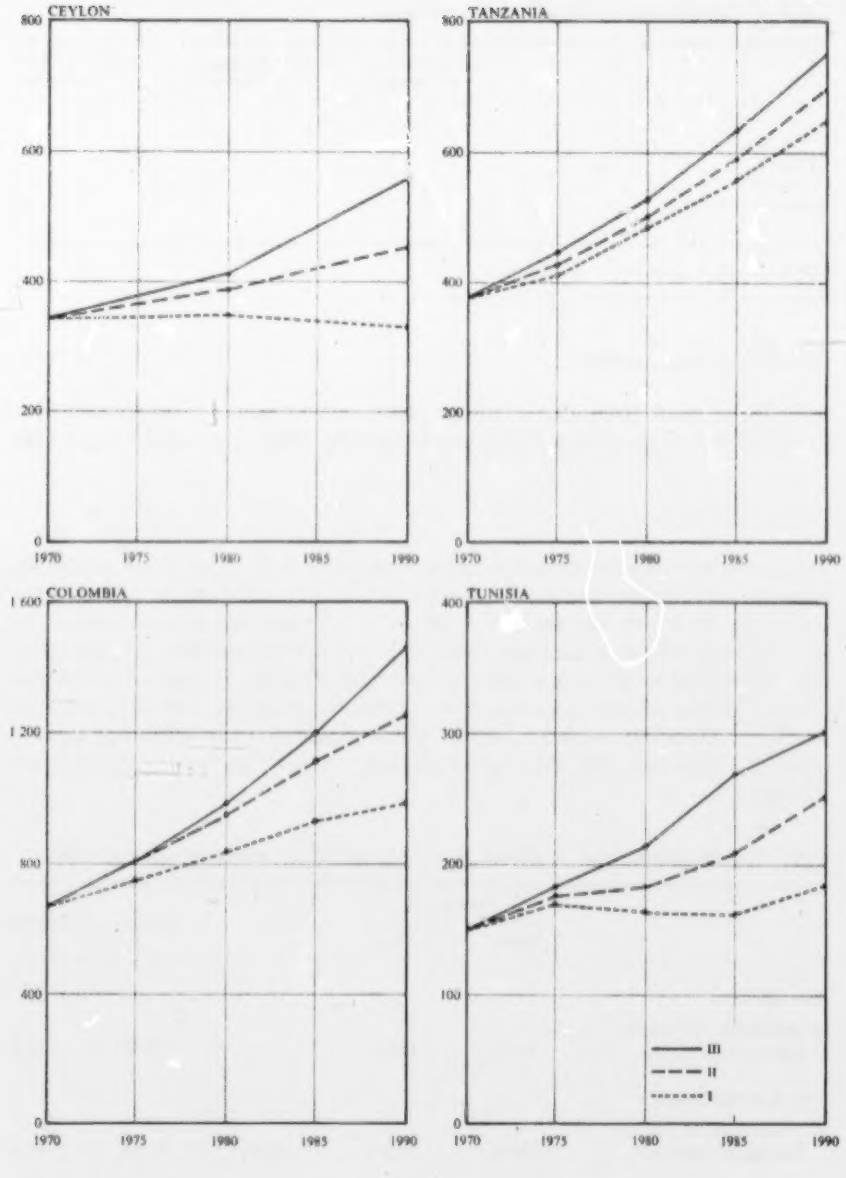

FIGURE 5. *Trend of admission-age population, in thousands*

TABLE 4. Growth rates of admission-age population

	Low assumption (percentage)	Medium assumption (percentage)	High assumption (percentage)
Ceylon	—	1.4	2.4
Tunisia	0.8	2.3	3.7
Colombia	2.0	3.1	3.7
Tanzania	2.7	3.1	3.5

SOURCE See note 1, page 19.

Growth of new entries

In order to move from admission-age population to new entries, account must be taken both of the present and future level of the intake rate and of late entries.

THE INTAKE RATE

The intake rate may be defined in the narrow sense as the proportion of children reaching the official admission age who are actually admitted to school. This definition, however, has the disadvantage of disregarding late entries, which may be very important in some countries. A more precise idea of total intake can be obtained by defining a cohort intake rate. This rate is equal to the proportion of children of the same cohort who, sooner or later, are eventually admitted to school. With this second definition, it can be said that admission is practically total in Colombia, and may be in Ceylon, though not yet in Tunisia and Tanzania.

TABLE 5. New entries, total enrolment in the first grade and admission-age population

	Colombia		Ceylon	Tunisia	Tanzania
	Urban	Rural			
New entries					
as percentage of admission-age population	118.2	134.1	...	78.9	43.0
First year enrolments					
as percentage of admission-age population	146.5	183.9	126.3	114.4	43.0

... Data not available

SOURCE Calculated from the data in the four case studies.

The rates shown in table 5 do not really constitute a cohort intake ratio. To calculate such a ratio it would have been necessary to follow a cohort and see what members of that cohort were successively admitted to school. The statistics of the countries analysed are not sufficiently precise and detailed to allow such a calculation. We have therefore related all admissions (whatever the age) to the admission-age population. Late entries have the effect of swelling this percentage which, in some cases is well above 100.

In Ceylon, in the absence of data on new entries, we have had to use total enrolment in the first grade. The rate obtained is therefore swollen both by late entries and by repeaters. The magnitude of repetition can be measured by the difference between new entries and total first-grade enrolment. It is particularly large in Colombia (especially in the rural areas) and in Tunisia.

The present intake rate is relatively low in Tanzania and the growth of this rate to the planned level of 95 per cent in 1989 implies a particularly substantial effort. Figure 1, page 200, in the Tanzanian case study, indicates the comparative trend of the school pyramid and the school-age population pyramid in 1968, 1979 and 1989.

LATE ENTRIES

Late entries are particularly marked in the rural areas of Colombia. The percentage of new entries compared with the population aged 7 is 118.2 in the urban areas and 134.1 in the rural areas. The details of the intake ratio at different ages are shown in table 10, page 134, in the Colombian case study.

These late entries, as they create a certain lack of uniformity of age in the different grades, raise educational problems, and the Colombian government is making every effort to reduce them rapidly. Under present plans, all children of 7 should be admitted to school as from 1974.

In Colombia the situation is complicated further by the existence of private education, which is relatively widespread in the towns. In 1968 in urban areas the percentage of admissions at all ages compared to the population aged 7 was 82.6 for public education and 35.6 for private education, giving the total percentage of 118.2. Naturally, when late entries are absorbed and only children of 7 are admitted to school, this percentage will fall back to 100. Assuming that private education retains the same importance in future that it has today, the intake rate for children aged 7 will be around 70 per cent for public education and 30 per cent for private education. In fact, in 1968 the intake rate for 7-year-old children was only 35.2 per cent for public education and 21.9 per cent for private education.[1] The absorption of late entries therefore implies that these rates must be gradually increased to the level indicated above.

Naturally, as and when admissions at the official age increase, the proportion of late entries will fall. In the light of past trends and the objectives of the

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[1] It will be noted that late entries are more numerous in public education than in private education.

Colombian government, the absorption of late entries has been projected as shown in table 6.

TABLE 6. Trend of intake rate in the urban areas of Colombia (public and private schools)

Age	1968	1969	1970	1971	1972	1973	1974
Public schools							
7	35.2	*38.0*	42.0	47.0	52.0	60.0	70.0
8	23.1	21.0	*19.0*	17.0	16.0	13.0	10.0
9	11.7	11.0	9.5	*9.0*	8.0	7.0	5.0
10	7.5	6.0	4.0	3.0	*3.0*	2.0	—
11 and over	9.3	6.0	4.0	2.0	—	—	—
Private schools							
7	21.9	*22.5*	23.5	24.5	26.0	28.0	30.0
8	6.8	6.0	*5.8*	5.5	5.0	4.0	2.0
9	3.3	2.4	1.5	*1.3*	1.0	0.5	—
10	1.9	1.5	1.2	0.6	*0.4*	—	—
11 and over	2.2	1.7	1.0	0.5	—	—	—

SOURCE 1968: see table 10, page 134.
1969: estimates
1970-74: IIEP projections.

It will be noted that in order to obtain the intake rate of a cohort, the intake rates must be added diagonally (figures in italic in table 6). Thus the total intake rate of the cohort born in 1962 is equal to the sum of the intake rates of children aged 7 in 1969, 8 in 1970, 9 in 1971 and 10 in 1972.

The gradual rise in the intake rate of 7-year-old children during the period 1968-74, while late entries continue to exist (though in diminishing numbers), will have the effect of increasing new entries at a rate higher than the increase in the number of 7-year-old children. From 1975 onwards, when late entries are entirely absorbed, new entries will follow the increase in the number of children aged 7. This feature of the absorption of late entries is shown in figure 2, page 150, in the Colombian case study.

There are various causes for late entries and it will probably take longer to absorb them than provided for in the Colombian plan. But the length of the period needed does not change the nature of the problem. It merely postpones the moment when the curve of entries coincides with the curve of the 7-year-old population.

GROWTH OF TOTAL ENTRIES

The future growth of entries depends not only on the population growth, but also on the present level of the intake rate. As we have seen, this rate is very different in the four countries. It is relatively low in Tanzania (43.0 per cent).

Growth will therefore be much greater in Tanzania than in the other countries. Figure 6 shows the comparative increase in new entries and in admission-age population. This figure calls for the three following comments.

The first relates to the magnitude of the effort which Tanzania will have to make in order to arrive at universal admission in 1989. In order to achieve this target the growth rate of new entries will have to be practically double the growth rate of the admission-age population.

The second concerns Ceylon. In this country, the statistics do not distinguish between new entries and repeaters. The curve plotted therefore relates not to new entries but to the total enrolment of the first grade.[1] That is why it is higher than the population curve.

Finally, the third comment relates to Colombia. As we have noted, private education is relatively well developed in that country. Since the present study only relates to public costs we have taken account only of entries into public education. The result is that the curve of entries into public education is below the population curve.

The projection of first-level enrolments

The total number of first-level enrolments in relation to new entries depends mainly on the length of first-level education. This may vary in different countries: it is five years in Colombia, six years in Tunisia, seven in Tanzania and eight in Ceylon.[2]

This official duration, however, does not correspond to the real average length of schooling which is increased by repeating and diminished by drop-out.

The difference between the actual average length of schooling and the official length—a difference which varies widely in these four countries—demonstrates the relative character of the concept of official length of schooling between countries. The comparison between Tunisia and Tanzania is particularly significant in this connexion. Whereas the official length of schooling is shorter in Tunisia than in Tanzania, the actual average length is greater (table 7).

TABLE 7. Official length and actual average length of first-level schooling

	Ceylon [1]	Tanzania	Tunisia	Colombia	
				Urban areas	Rural areas
Official length	8	7	6	5	5
Actual average length	6.4	5.3	7.0	4.3	2.4

1. See footnote 2 below.

SOURCE Calculated from the data in the four case studies

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[1] Including repeaters.

[2] In theory there are eight grades in first-level schools in Ceylon, but the eighth class is in fact a preparatory class for second-level education.

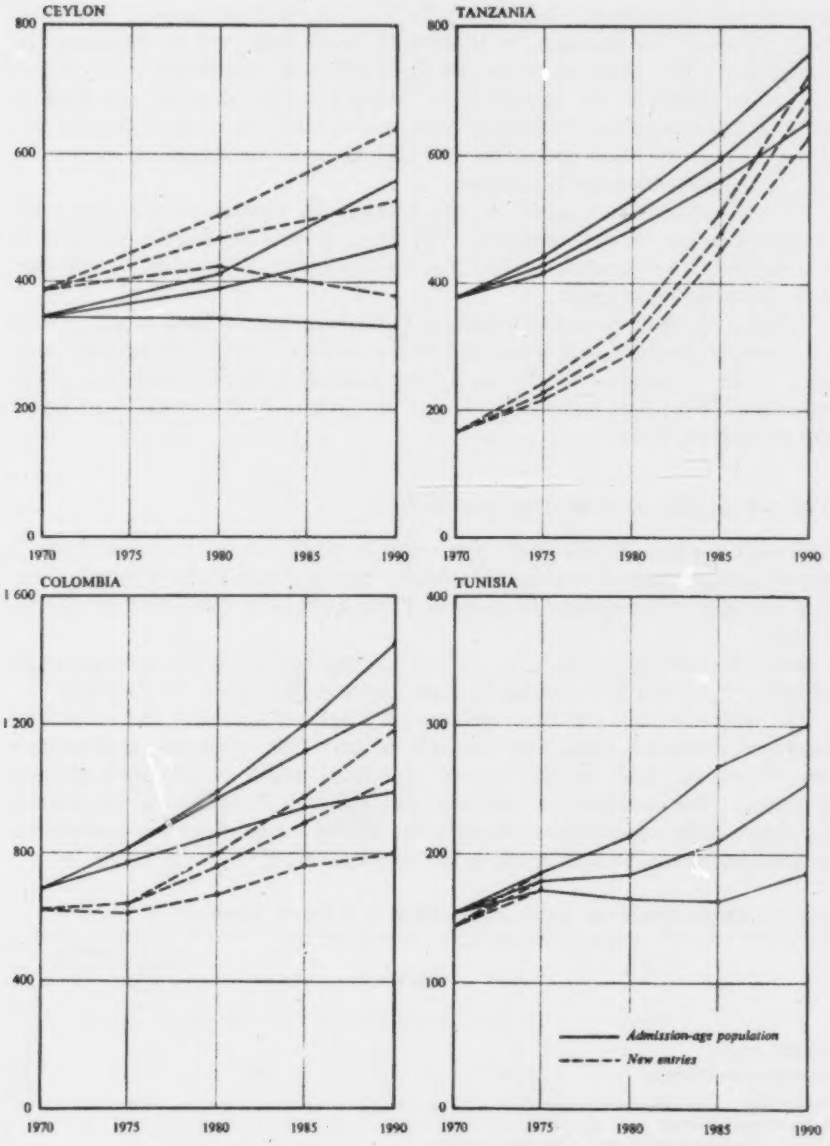

FIGURE 6. *Admission-age population and new entries in public first-level schools, in thousands*

In Tanzania, promotion is automatic and the difference between official length and real length is essentially explained by the fact that there is a selective examination between lower and upper stage first-level school, so that substantial drop-out is found at the level of the fourth grade. In Tunisia there is little drop-out, but on the contrary, repeating is very high which explains why the real length is higher than the official length. In Colombia repeating is high, but drop-out is such, particularly in the rural areas, that the real length of schooling is well below the official length.

Table 8, by way of example, gives the promotion, repetition and drop-out rates for Tunisia and Colombia.

TABLE 8. Promotion, repetition and drop-out rates for Colombia (rural and urban areas) and Tunisia

	Promotion rate	Repetition rate	Drop-out rate
Colombia (1963-67)			
Urban areas			
Grade I to II	0.59	0.23	0.18
Grade II to III	0.70	0.19	0.11
Grade III to IV	0.73	0.17	0.10
Grade IV to V	0.76	0.13	0.11
Grade V	—	0.10	—
Rural areas			
Grade I to II	0.37	0.30	0.33
Grade II to III	0.25	0.25	0.50
Grade III to IV	0.38	0.17	0.45
Grade IV to V	0.45	0.12	0.43
Grade V	—	0.12	—
Tunisia (1962-67)			
Grade 1 to 2	0.68	0.32	—
Grade 2 to 3	0.77	0.22	0.01
Grade 3 to 4	0.69	0.27	0.04
Grade 4 to 5	0.66	0.28	0.06
Grade 5 to 6	0.60	0.32	0.08
Grade 6	0.39	0.43	0.18

SOURCE Colombia: DANE, 'La educación en Colombia' in *Boletín mensual de estadística*, Bogota, Departamento Administrativo Nacional de Estadística, 1969

Tunisia: Republic of Tunisia, *Statistiques de l'enseignement, année scolaire 1966-67*, Tunis, Secrétariat d'état au plan et à l'économie nationale, 1968.

The phenomenon of repetition and drop-out can also be observed by analysing the school pyramid as shown in figure 7. The magnitude of drop-out in the rural areas of Colombia will be noted in particular. Owing to this drop-out, the different steps of the school pyramid narrow very rapidly as one goes up the scale of grades.

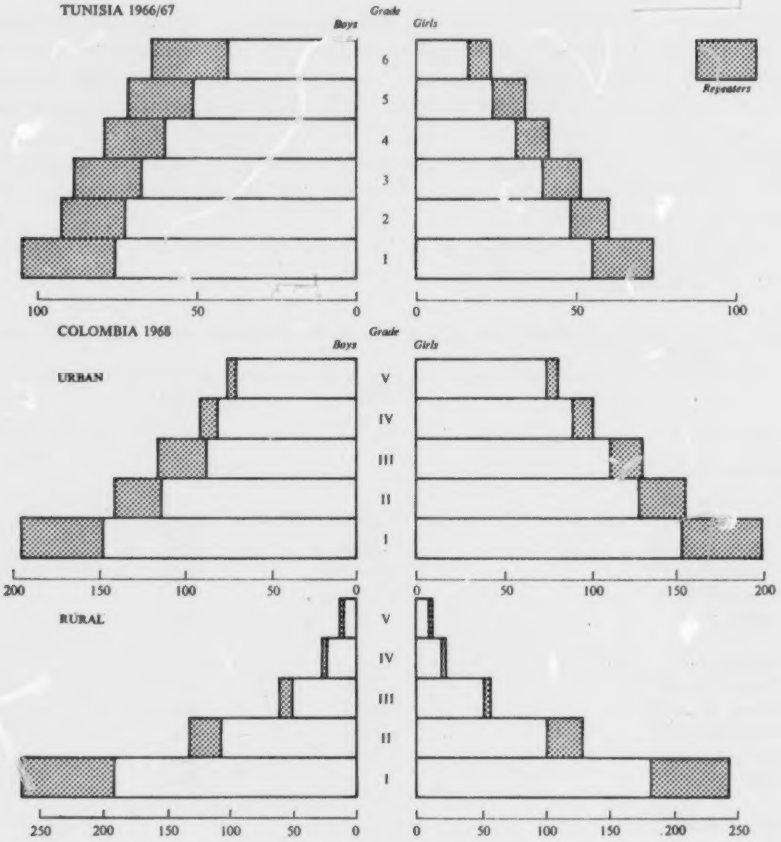

FIGURE 7. *First-level enrolments by sex and year of schooling (total enrolments and repeaters)*

From the average rates of promotion, repetition and drop-out, the retention rates of a cohort can be calculated.[1] In view of the magnitude of drop-out and the efforts being made by governments to reduce it, a certain improvement in these retention rates has been assumed.

Allowing for the assumed improvement in retention rates, the average length of schooling will increase. This increase is particularly noticeable in Colombia owing to the present high level of drop-out. It will also be substantial in Tanzania because of the abolition of the selective examination between lower and upper stage first-level school. It will be low in Tunisia, where the drop-out rates are low and where the effect of the diminution in drop-outs on total enrolment is partly offset by the reduction in repetition.

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[1] Owing to repetition, the enrolments in each grade are made up of members of several cohorts who have entered school successively. For this reason the average rates observed in successive grades cannot be used directly to reconstitute the behaviour of a cohort. These rates should therefore be readjusted.

If entries are constant, the ratio between new entries and total enrolment is equal to the average length of schooling. If entries are increasing in number, the ratio between new entries in a given year and total enrolment for the same year is less than the average length of schooling. More generally, it can be said that the higher the growth of entries, the greater the difference between the average length of schooling and the ratio between new entries and total enrolment.[1]

This ratio will therefore depend on population growth, as shown in table 9, which indicates the average length of schooling in 1968, the estimated average length for 1989 and the ratio between new entries and total enrolment in the four countries studied.

In the case of the low population assumption, and of the consequent small increase in new entries, the ratio between new entries and total enrolment is very close to the average length of schooling. There is, however, one notable

TABLE 9. Average length of schooling and ratio between new entries and total enrolment

	Ceylon	Tanzania	Tunisia	Colombia	
				Urban areas	Rural areas
Official length of schooling	7.0	7.0	6.0	5.0	5.0
Average length of schooling in 1968	6.4	5.3	7.0	4.3	2.4
Average length of schooling in 1989	7.2	6.6	7.2	5.1	4.9
Ratio between new entries and total enrolment:					
Low population assumption	7.5	5.5	7.0	4.9	4.8
Medium population assumption	7.0	5.4	6.6	4.8	4.7
High population assumption	6.7	5.3	6.3	4.7	4.[illegible]

SOURCE Calculated from the data given in the four case studies.

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[1] The effects of the growth of entries on the ratio between new entries and total enrolment are analysed in detail in the *Model* on p. 305.

exception to this, namely Tanzania. There are two reasons for the difference observed here. The first is that in Tanzania it has been assumed that fertility will remain at its present level, so that even on the low population assumption the growth rate of the admission-age population remains high (2.8 per cent per annum). The second is that the intake rate in public education is only 43 per cent and that the aim of the Tanzanian government is to increase it to 95 per cent in 1989. This increase can, however, only be gradual. The cohorts which will be in first-level schools in 1989 will be those which entered between 1983 and 1989. Between these two dates the intake rate, according to present plans, should rise from 73.6 per cent to 95 per cent. As a result, even under the low population assumption, the annual growth rate of entries from 1983 to 1989 should be 7.4 per cent per annum, and it is this high growth rate which explains the difference between the average length of schooling and the ratio between new entries and total enrolment.

Finally, it can be said that the growth of enrolment is the combined effect of population growth and of the trend of the intake rate and the retention rates. The combined effect of these three variables is illustrated in figure 8 for Ceylon and Tanzania, which are to some extent the two extreme cases of our sample. Between 1968 and 1989 total enrolment in Ceylon will be multiplied by 1.16 to 1.75 according to the population assumption adopted, while those of Tanzania will be multiplied by 4.28 to 4.87. This big difference is partly due to the population trend projected for Ceylon and Tanzania (a more or less rapid fall in fertility in Ceylon and a constant fertility rate in Tanzania). More importantly it is due to the present degree of development in first-level education. Admission is already total in Ceylon, whereas in Tanzania it covers only 43 per cent of 7-year-old children.

Projection of teacher needs

The projection of teacher needs is an essential part of assessing the effect of population growth on educational costs. This projection should make it possible, first to calculate the salary costs of first-level education, which form the greater part of total costs at this level, and secondly, to project teacher-training enrolment and therefore the costs of teacher training.

The projection of teacher needs can be effected in three stages: projection of total teacher needs; breakdown of teachers by level of qualification; breakdown of teachers by length of service.

Projection of total teacher needs

The simplest way to project total teacher needs is to use an average pupil/teacher ratio. This method, however, is not altogether satisfactory for three reasons.

The first is that, as a result of repetition and above all of drop-out, the average size of classes may differ in the various grades.

The second is that the number of teachers needed may not be the same as the number of classes. In Tunisia, this difference is due to the fact that the number of hours taught per week varies from fifteen in the first grade to twenty-seven and a half in the sixth grade. On the other hand, teachers are required to teach

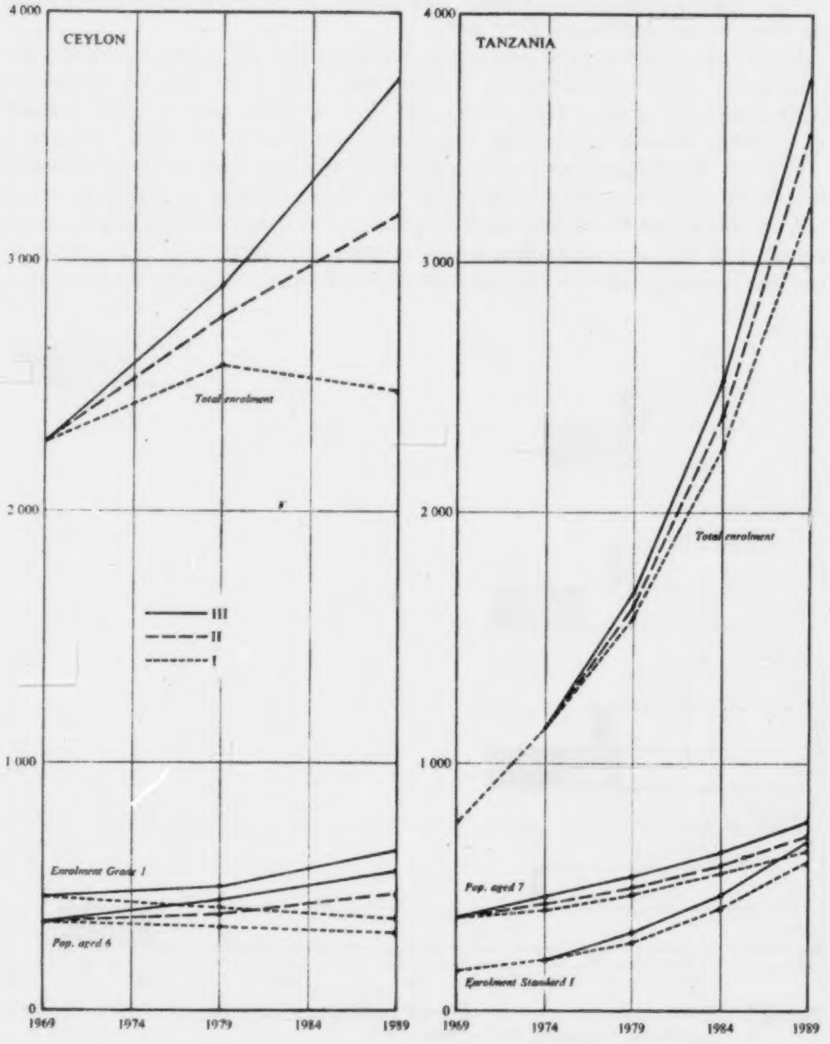

FIGURE 8. *Trend of population aged 6 or 7, enrolment in first grade, and total enrolment from 1969 to 1989*

thirty hours. The result is that, in general, a teacher teaches in two different classes.[1] In Tanzania the difference is due to similar reasons. Standards I and II are half-day classes, and in general, the same teacher takes both classes. On the other hand, an additional teacher is appointed for each group of standard VI and VII, in view of the heavier work-load.[2]

The third reason is that the level of qualification of teachers sometimes depends on the level of class which they teach.

From what has been said previously, it follows that the average pupil/teacher ratio is too crude a measurement, and one which closely depends on the pattern of enrolment by grade. This pattern may, on the other hand, change, because of a change either in the growth rate of new entries or in the retention rates.

It is for this reason that in projecting total teacher needs, we have preferred first to project the number of classes at the different grades and then go on to project the number of teachers needed on the basis of the staffing formula adopted. Needless to say, current staffing formulae must take account of the number of teachers available and the existing training facilities of teacher-training colleges.

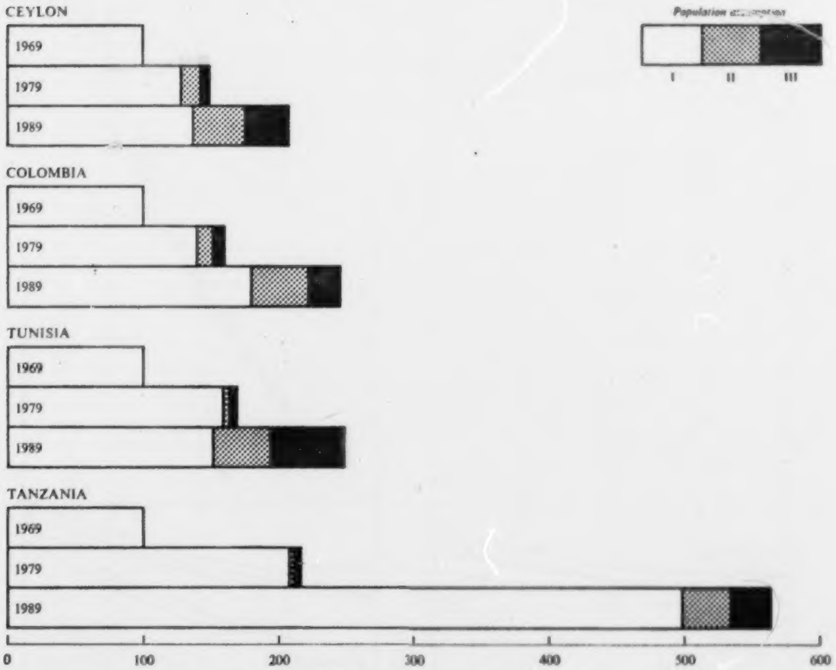

FIGURE 9. *Trend of teacher needs on different population assumptions, in Ceylon, Colombia, Tunisia and Tanzania (1969 = 100)*

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1. See page 243.
2. See pages 187 and 203.

They are therefore not immutable. In long-term projections of the type we have to make here, the possibility of an improvement in the staffing formula should be taken into account. Various alternatives have been used on this point in the four case studies.

The influence of population growth on total teacher needs resembles its influence on total enrolment. These two variables are, moreover, closely linked. Figure 9 shows the trend of teacher needs on the various population assumptions. For the sake of clarity, only one staffing formula has been adopted; the highest alternative.

The delayed effect of a fall in fertility on the trend of teacher needs will be noted. In 1979 the differences between the different population assumptions will be relatively slight, but they will be much more marked in 1989.

In Ceylon the growth in teacher needs is almost entirely due to population growth and an improved staffing formula. In Colombia an improvement in the retention rates, particularly in rural areas, must be added to these two causes, while in Tunisia, and above all in Tanzania, we should also take into account the increase of the intake rate. It is these differences which account for the fact that the growth rate of teacher needs is far from being the same in the four countries. Over the next twenty years the number of teachers needed will be doubled in Ceylon (on the high population assumption), whereas in Tanzania it will be practically multiplied by five.

Breakdown of teacher needs by level of qualification

In the four countries studied, as indeed in most developing countries, there are various categories of first-level school teachers with differing levels of qualification. There are several explanations for this diversity of qualifications. In Tanzania the diversity is due to the fact that the staffing formula provides for teachers with varying kinds of training at different grades of first-level education: for example, in the first four years of first-level schooling the teachers are, in principle, grade C teachers who have two years of teacher training after completing first-level education. In the higher classes the teachers also have two years of teacher training, but after a longer period of general education.

In Colombia, the diversity arises from the substantial wastage of teachers and the low percentage of certificated teachers who do in fact teach. Because of the relative unpopularity of teaching as a career, partly explained by salary levels, it has been necessary to recruit a high proportion of unqualified teachers.

In Tunisia, increased needs due to increased enrolment have outrun teacher-training facilities. Table 10 illustrates the qualification profile and median salary level of different categories of teacher in Colombia, Tanzania and Tunisia.

In view of the differences between teacher-training systems and recruitment methods, it is very difficult to compare the relative level of teacher qualification in these four countries. The various assumptions made in the case studies as to the progressive improvement of the qualification profile of teachers have therefore been based on the particular situation of each country, and the policies

TABLE 10. Percentage of teachers by qualification and median salary

Category	Percentage in 1970	Median salary
Colombia (pesos)		
Category 1	27.7	16 900
Category 2	32.4	14 950
Category 3	12.2	13 000
Category 4	7.0	11 700
Unestablished	20.7	9 100
Tanzania (shillings)		
Category A	19.8	10 020
Category B	14.4	9 050
Category C	65.8	6 240
Tunisia (dinars)		
Assistant teacher	64.9	948
Monitor 1	35.1	777
Monitor 2		593

SOURCE Calculated from the data given in the case studies on Colombia, Tanzania and Tunisia.

envisaged by the different governments. The pay differentials between varying categories of teacher are relatively large, and the improvement of the teacher qualification profile will, as we shall see later, have important repercussions on cost.

Breakdown of teacher supply by length of service

The current salary scales for teachers in most countries provide for progressive pay increases according to merit and experience but, owing to the difficulty of assessing the merit of teachers, length of service is the main criterion.

The difference between minimum and maximum salary within one category of teachers may be relatively large. Table 11 gives the summary salary scale for category C teachers in Tanzania.

TABLE 11. Average salary by length of service for category C teachers in Tanzania (shillings)

Length of service	Average salary
0 to 4 years	3 800
5 to 9 years	4 980
10 to 14 years	6 300
15 to 19 years	8 040
Over 20 years	8 880

Any change in the structure of the teaching staff by length of service is therefore likely to have a marked effect on costs. The trend of this structure naturally depends on the present breakdown of teachers by length of service, wastage and the relative magnitude of wastage for different lengths of service (expressed by the rate of wastage according to length of service). But it mainly depends on the rate of increase in newly recruited teachers and therefore on the growth of school enrolment.

In general, it can be said that an increase in the growth rate of enrolment—compared with past trends—means a reduction in the average length of service. Conversely, a slowing down in the growth of enrolment means an increase in average length of service. The result is that the length-of-service structure of the teaching force depends on the population assumption adopted.

TABLE 12. **Trend of average salaries of category C teachers according to population assumptions in Tanzania (shillings)**

Year	Population assumptions	Average salary
1970		5 652
1979	low	5 239
	medium	5 203
	high	5 170
1989	low	4 897
	medium	4 852
	high	4 821

The effect of the various population growth assumptions for Tanzania on the structure of the teaching force by length of service and therefore on their average salary level is shown in table 12. In order to single out the consequences of a progressive reduction of length of service, we have assumed that salary scales remain at their present level. We have taken account of only one category of teacher.

It is true that in Tanzania the average length of service of teachers as measured by average salary level, varies little from one projection to another since these projections themselves do not differ greatly,[1] and the effect of the rate of increase in enrolment on the average length of service of teachers is not very marked if we compare one projection with another. But the effect is much more marked when the situation in 1970 is compared with the that in 1989. Over this period, as a result both of the growth of school-age population and of the increase of the intake rate, enrolment will rise very sharply, involving considerable recruitment of new teachers and consequently a marked fall in the average length of service. The result is a significant fall in average salaries (on the assumption that salary scales remain unchanged).

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[1] Owing to the hypotheses adopted for the trend of fertility.

III The effects of population growth on the cost of first-level education and teacher training

The effect of population growth on the recurrent costs of first-level education is somewhat different from its effect on capital and teacher-training costs. Whereas recurrent costs depend on the *level* of total enrolment, capital and teacher-training costs depend on the *growth* of total enrolment. The result is that the last two types of cost are much more sensitive to the various population assumptions, as we shall see below.

Projection of the recurrent costs of first-level education

In projecting recurrent costs, it is useful to distinguish between salary, teaching material and social costs. This distinction is necessary because the factors which may influence these three types of cost are different and induce specific trends. The present breakdown of these costs is shown in table 13.

TABLE 13. Percentage breakdown of recurrent costs of first-level education

	Colombia	Tunisia	Tanzania
Salary costs	93.0	90.7	76.4
Teaching material costs	7.0	2.5	14.9
Social costs	—	6.8	8.7
	100.0	100.0	100.0

SOURCE Case studies on Colombia, Tunisia and Tanzania

Salaries constitute unquestionably the greater part of the costs of first-level education, but the relative share of the other sectors varies widely from country to country. Teaching materials seem particularly low in Tunisia. It is somewhat difficult to compare levels of expenditure in so far as part of the teaching material costs may be borne directly by parents (e.g., books and other school supplies). Social costs consist mainly of canteens, as in Tunisia, or boarding facilities, as in certain first-level schools in Tanzania.

Projection of salary costs

In order to isolate the different factors which may influence salary costs, we shall analyse first the average per teacher and then total salary costs.

AVERAGE COST PER TEACHER

As we have already noted, average teacher cost depends on the trend of the qualification profile of the teaching force and the structure by length of service. It also depends upon the effect of economic growth on salary levels.

The growth of costs resulting from improved qualifications depends on the present structure of the teaching force and the policy for future changes. In the case studies various assumptions have been adopted for the progressive improvement of teacher qualifications, and the increase under each of these assumptions has been estimated to show possible variations of these costs in relation to the different changes in the qualification profile.

It is not easy to assess the effect of economic growth on the level of teachers' salaries; the way in which these salaries are determined, especially in the developing countries, means that they depend much more on the influence of the teachers' trade unions and the general trend of civil service pay than on the labour market situation, and still less on average productivity.

In the absence of precise information as to salary trends, it has been assumed that the relative level will be maintained. In other words, it has been assumed that their growth will keep pace with the growth of GDP per person of working age.[1] The effect of a fall in fertility is more or less delayed, according to the age group considered. If, during the next twenty years, a more or less pronounced fall in fertility has a marked effect on the size of the school-age population, it will have only a slight effect on the working-age population. This is why, given the same economic growth, over the next twenty years the trend of GDP per person of working age varies little from one population assumption to another.

In the case studies, a number of assumptions were made as to economic growth with a view to indicating the proportion of first-level education and teacher-training costs under these different assumptions. To avoid complicating the presentation with the various alternatives of economic growth and the various alternatives of improved teacher qualification, and merely to give an order of magnitude to the effect of these two factors on costs per teacher, we have indicated in table 14 only the increase corresponding to the highest assumption.

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[1] GDP per person of working age has been used in preference to GDP *per capita* because it affords a better representatation of the trend of average productivity. No doubt it would have been even better to take the GDP per active population, but in view of the characteristics of production in the developing countries, particularly in the rural areas, it is difficult to estimate the rates of activity by age and sex. Furthermore, it seems somewhat arbitrary to forecast the future trends of these rates.

TABLE 14. Increased costs per teacher resulting from improved qualification and the effect of economic growth (1969-89)

Factors of increase	Colombia	Tanzania
Increase due to improved qualification	1.548	1.131
Increase due to economic growth	1.327	1.486
TOTAL	2.054	1.681

SOURCE Calculated from the data given in the case studies on Colombia and Tanzania.

In the countries studied, increases due to economic growth are fairly comparable; these increases are the result of differences between the economic growth rate assumed and the growth rate of the working-age population. Differences in growth of salaries due to improved qualifications vary considerably, however, from country to country.

These differences arise mainly from the fact that the percentage of teachers judged to be insufficiently qualified varies from country to country.[1] The effect of the improvement in qualification and of economic growth on teachers' salaries will lead to an increase in the average salary cost per teacher of 50 to 100 per cent over the next twenty years.

TOTAL SALARY COSTS

The increase of salary costs per teacher will have a considerable effect on the increase of total salary costs, but total costs will also depend on the trend of teacher requirements.

Figure 10 shows the increase of total salary costs from 1968 to 1989. As will be seen, the trend is very different from one country to another.

It will be noted in the first place that the difference in total salary costs between the low and high population assumptions is far from being the same in the four countries concerned. In Tunisia, for example, total salary costs in 1989 are almost twice as much on the high assumption as they are on the low assumption. This shows the considerable effects which a rapid fall in fertility may have on educational costs. In Tanzania the differences are much slighter since, as we have seen, the differences between the projections are themselves small.

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[1] It should be made quite clear that it is not our intention to compare the relative level of teacher qualification in these countries. The differences in training systems and recruiting methods would make such a comparison somewhat arbitrary. Our object is simply to show the increase in costs resulting from the gradual replacement, in *each* of these countries, of teachers deemed to be insufficiently qualified.

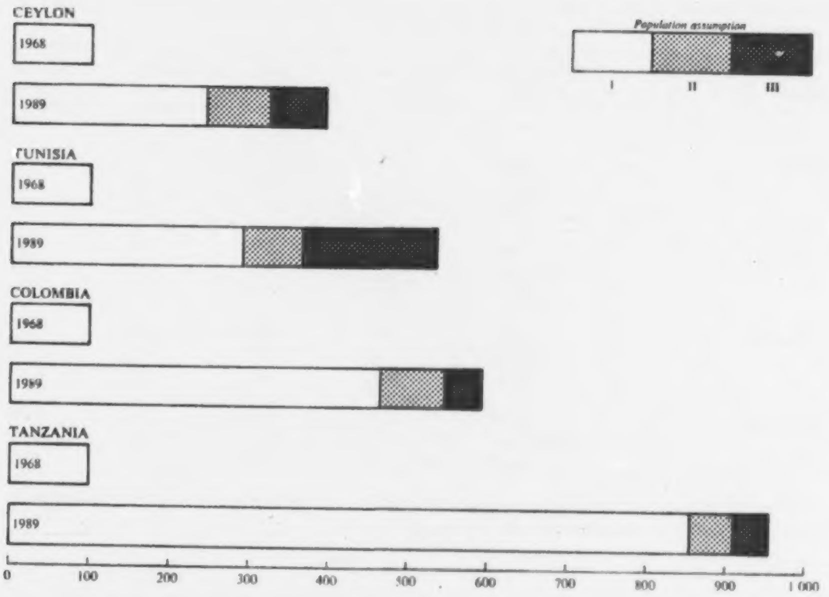

FIGURE 10. *Growth of total salary costs on different population assumptions in Ceylon, Tunisia, Colombia and Tanzania (1968 = 100)*

The point which should be particularly stressed is that, even on the high population assumption, total salary costs for first-level education in Ceylon will be multiplied only by 3.7 between 1968 and 1989, whereas in Tanzania they will be multiplied by nearly 10. The effort to be made in the two countries over the next twenty years is therefore very different. Whereas in Ceylon, as we have previously noted, first-level admission is already total—with the result that the growth in salary costs is due entirely to the improved retention rate, improved teacher qualification and better staffing formula—in Tanzania the intake rate is barely 43 per cent. The progressive increase of the intake rate is therefore an additional and significant factor in the total increase of salary costs.

In order to bring out clearly the respective role of the different variables which influence the growth of total salary costs, we have indicated in table 15 the respective growth rates of admission-age population, total enrolments, number of teachers and total salary costs.

It will be noted in the first place that the growth rate of the admission-age population differs greatly from country to country and according to the population assumption adopted. It varies from nil in Ceylon on the low population assumption to 3.7 per cent in Tunisia and Colombia on the high assumption. But it is mainly in the growth rate of salary costs that the differences are greatest.

TABLE 15. Annual growth rate of admission-age population, total enrolments, number of teachers and total salary costs (1968-89)

Country	Population assumption	Admission-age population (percentage)	Total enrolments (percentage)	Number of teachers (percentage)	Total salary costs (percentage)
Ceylon	low	—	0.7	1.5	4.4
	medium	1.4	1.9	2.8	5.6
	high	2.4	2.7	3.5	6.4
Tunisia	low	0.7	1.9	2.9	6.2
	medium	2.3	3.1	4.2	7.5
	high	3.7	4.3	5.4	8.7
Colombia	low	2.0	2.7	3.2	6.7
	medium	3.1	3.7	4.3	7.7
	high	3.7	4.2	4.8	8.1
Tanzania	low	2.7	7.2	8.7	10.9
	medium	3.1	7.5	9.1	11.2
	high	3.4	7.8	9.4	11.5

SOURCE Calculated from the data given in the four case studies.

The difference between the growth rate of admission-age population and that of total enrolment also varies from country to country. In Ceylon, Colombia, and Tunisia this difference is relatively slight, since it is mainly due to the improvement in the retention rates.[1] In Tanzania it is very large because the rapid growth of the first-level intake rate must be added to the improvement in the retention rates.

The difference between the growth rate of the number of teachers and that of enrolments is explained by the improvement of the staffing formula. It is again in Tanzania that this difference is greatest, owing to the relatively high level of the present pupil/teacher ratio.

The difference between the growth rate of the number of teachers and that of salary costs arises out of the improvement of teacher qualification and the effect of economic growth on the average level of teachers' salaries. It is in Colombia that this difference is greatest, owing to the assumptions adopted about the improvement of the qualification profile of the teaching force.

It can be said that, even in the absence of any population growth, the need to improve the quality of first-level education and the effect of economic growth on the average salary level will involve a substantial increase in salary costs. The magnitude of this increase can be measured in the case of Ceylon, where, in spite of the fact that the admission-age population is constant, the annual growth rate of salary costs is 4.4 per cent.

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[1] The effect of this difference is, moreover, partly reduced by the absorption of late entries in Colombia and Ceylon.

Projection of other recurrent costs of first-level education

The growth of the other recurrent costs of first-level education (i.e. essentially maintenance, teaching materials, and social costs) depends on the specific situation and the present level of these cost in the different countries. In general, it can be said that maintenance and teaching material costs are often too low and schools are not always provided with all the facilities they need. This is particularly true for teaching materials and school supplies.

Although it may be arbitrary to estimate the future trend of these costs, an effort has been made to do so in the case studies, in the light of the special characteristics of each country. In Colombia and Tunisia,[1] and above all in Ceylon, a fairly substantial increase in these costs is projected. Tanzania is the only country in which these costs will fall, owing to the gradual suppression of boarding facilities due to the development of first-level education.

TABLE 16. Recurrent costs of first-level education in 1968 and 1989, by country and population assumption (thousands of monetary units)

	1968	1989		
		Assump. I	Assump. II	Assump. III
Ceylon				
Salary costs	196 000	488 100	623 400	725 100
Other costs	25 000	99 600	128 600	150 400
TOTAL	221 000	587 700	752 000	875 500
Index	100.0	265.9	340.3	396.1
Colombia				
Salary costs	782 500	3 119 300	3 754 500	4 073 800
Other costs	58 900	234 800	282 600	306 600
TOTAL	841 400	3 354 100	4 037 100	4 380 400
Index	100.0	398.6	479.7	520.5
Tunisia				
Salary costs	13 313	47 216	60 248	77 071
Other costs	2 049	3 898	5 005	6 442
TOTAL	15 362	51 114	65 253	83 513
Index	100.0	332.7	424.8	543.6
Tanzania				
Salary costs	95 405	835 462	886 473	930 352
Other costs	29 413	105 781	113 091	120 162
TOTAL	124 818	941 243	999 564	1 050 514
Index	100.0	754.1	800.8	841.6

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[1] Note that in Tunisia non-salary costs are estimated to increase less quickly than salary costs.

Table 16 shows the increase in total expenditure of first-level education from 1968 to 1989. Even where an appreciable improvement in maintenance and teaching material expenditure has been assumed, the proportion of salary costs remains very high, and it can be said that the increase in total costs largely depends on the increase in salary costs, the causes of which have been analysed above.

Projection of capital costs

As capital costs do not depend on total enrolment but on the growth rate of enrolment, their trend over a period of time may be very different from that of recurrent costs. For obvious reasons, recurrent costs tend to grow fairly regularly over a given period. Capital costs, on the contrary, may fluctuate very widely from one year to another, as shown in figure 11, which plots the trend of recurrent and capital costs in Tunisia from 1962 to 1968. For this reason, the level reached by capital expenditure in the course of a given year has little significance and it is somewhat arbitrary to select a base year for comparison with the horizon year.

Projection of needs for new buildings

The growth of needs for new classrooms naturally depends on the growth of enrolments, which we have already analysed.[1] It also depends on the progressive reduction of the average size of classes where they are thought to be too large.

It must, however, be noted that at the present time there may be a fairly wide difference in the size of classes at different levels. Owing to drop-out there may be fewer pupils in the higher grades. An improved retention rate would therefore have the effect of narrowing these differences so as to result in the creation of fewer new classrooms in the upper grades than might be expected from a simple analysis of the increase in enrolment.

In addition to the new classrooms required by increased enrolment, allowance has also to be made for the number of classrooms which have to be replaced because they are no longer adequate for teaching. This has been very difficult to estimate because information on the state and age of the existing buildings is frequently lacking. Assumptions have therefore had to be made about the cost of replacement.

Projection of the cost of school building

Estimating the cost of building classrooms also raises problems in so far as costs financed by the government do not always cover the full cost. Very often they are limited to the supply of building materials, the cost of building proper being met by the local authorities, especially within the framework of community development programmes. Furthermore, the time-lag between the commitment of

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[1] See above, pages 28-38.

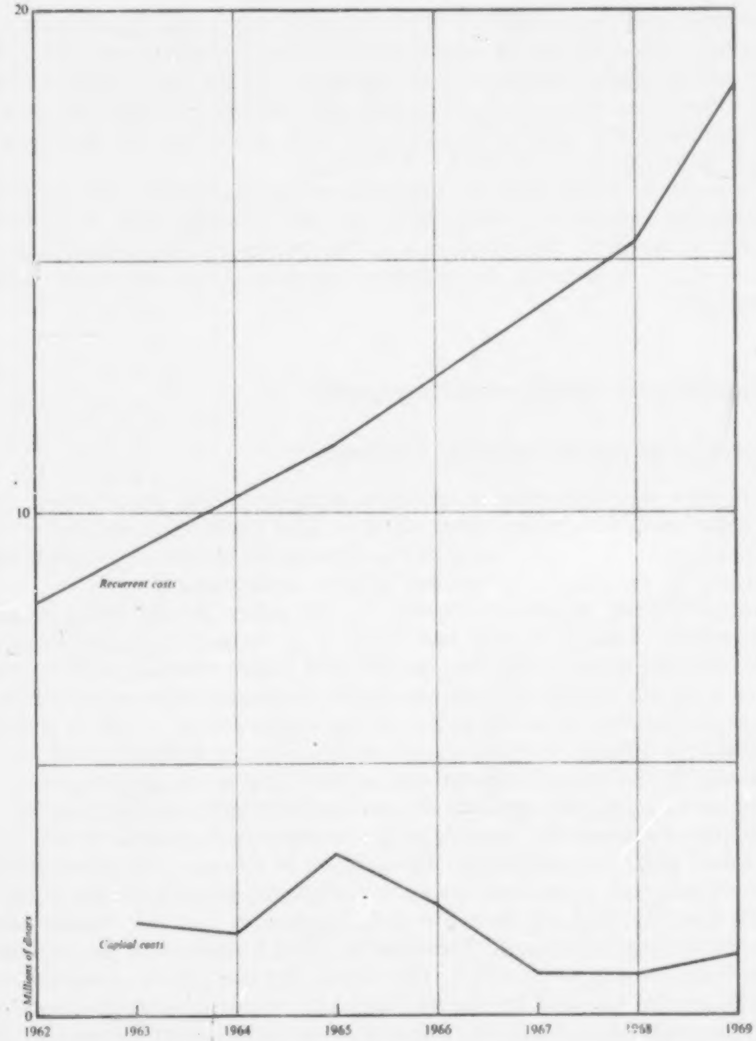

FIGURE 11. *Trend of recurrent costs and capital costs of first-level education in Tunisia*

expenditure and the completion of the building means that expenditure in a given year cannot always be related to the number of classrooms built. For these reasons when estimating capital expenditure in the case studies, we have used either central government block grants for building a classroon (in the case of Tanzania) or the building standards laid down by the Ministry of education (in the case of Ceylon, Colombia and Tunisia).

Finally, it should be noted that capital expenditure is incurred not only in the building and equipment of new schools but also, in many cases, in providing housing for teachers. The proportion of this housing in total expenditure may be very high. In Tanzania, for example, it absorbs almost half of the capital expenditure.

Projection of teacher-training costs

Projection of teacher-training enrolment

The increase in teacher-training enrolment depends on four main factors. The first is the increase in teacher needs which we have already analysed above. On this point, as in the case of capital costs, teacher-training costs vary considerably according to the different population growth assumptions.

Teacher-training enrolment depends on the policy for improving teacher qualifications. This policy may lead either to an increase in the percentage of newly recruited teachers who have, in fact, had teacher training (as in the case of Colombia and Tunisia) or to the recruitment of teachers with a higher standard of teacher training (as in Ceylon) or to the application of a staffing formula providing for different levels of teacher qualification for different grades (as in Tanzania). In this last case, the improved retention rate, by changing the pattern of enrolment by grade, may speed up the need for more highly qualified teachers.

The rate of increase also depends on the wastage rate for teachers (leaving the profession, death and retirement). The question of wastage of teachers becomes rather complicated where there are in-service training programmes for teachers. In this case, the teacher's absence is purely temporary and the effective result is merely a change of category. The extent to which teachers leave the profession varies from country to country.[1] The reasons for leaving are numerous and are different for men and for women. Some are connected with age (marriage, childbirth, retirement), others with length of service (choice of another career). But there is a close correlation between age and length of service and it is for this reason that, in the case of Tanzania, an attempt has been made to assess the wastage of teachers according to length of service. This method has the additional advantage of making it possible to assess the change in the structure of the teaching force by length of service, and therefore to make a better calculation of salary costs. It should, however, be noted that, in many developing countries, the structure of the teaching force and the rate of wastage by length of service are not available, with the result that wastage has had to be estimated indirectly.

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[1] It is particularly marked in Colombia, apparently because of the policy for teachers' pay.

The level of teacher-training enrolment depends on the length of teacher training. This varies in different countries. It is two years in Tanzania and six in Colombia. It is true that in Colombia the first four years of teacher training are mainly devoted to general education and teacher training proper is given only in the last two years. Students are recruited on the completion of their first-level education.

The cost of teacher training

The cost of teacher training varies widely from country to country (table 17). The differences arise mainly from the type of benefit accorded to student teachers, which may take the form of boarding facilities or of a certain remuneration which is in fact equivalent to a pre-salary. In Colombia these costs are practically nil. In Tanzania, and especially in Ceylon, they are particularly high and account for the greater part of teacher-training costs.

TABLE 17. Breakdown of teacher-training costs in Tanzania and Ceylon in 1969 (thousands of monetary units)

	Tanzania		Ceylon	
	Amount	Percentage	Amount	Percentage
Teachers' pay	5 242	42.5	2 598	22.1
Board and lodging	2 143	17.4	8 064	68.7
Allowances to student-teachers	2 871	23.3		
Others	2 064	16.8	1 075	9.2
	12 320	100.0	11 737	100.0

Total cost of first-level education and teacher training

We can now sum up the various costs of first-level education and teacher training and show their relative share in the total (table 18).

In all countries, whatever the demographic projection, recurrent costs of first-level education form the predominant part of total costs (from 85.7 to 94.7 per cent). It is, however, interesting to analyse the share of capital costs and teacher-training costs, since they vary widely from one demographic assumption to another.

Since these costs depend on the growth rate of enrolment and not on total enrolment, it is clear that they are much more sensitive to population assumptions, the progressive change in fertility having a marked influence on the growth rate of enrolment. In Tunisia and Colombia, the share of these costs in the total cost

TABLE 18. Total cost of first-level education and teacher training in 1989 according to the different population assumptions (thousands of monetary units)

	Population assumption					
	Low		Medium		High	
	Amount	Percent.	Amount	Percent.	Amount	Percent.
Colombia (pesos)						
Recurrent costs of first-level education	3 354 000	93.7	4 037 100	91.9	4 380 400	88.6
Capital costs	90 900	2.5	155 600	3.5	260 200	5.3
Teacher-training costs	135 500	3.8	200 800	4.6	305 200	7.1
Total	3 580 400	100.0	4 393 500	100.0	4 945 800	100.0
Tunisia (dinars)						
Recurrent costs of first-level education	51 114	95.4	65 253	92.3	83 513	89.8
Capital costs	1 687	3.1	3 848	5.4	6 690	7.2
Teacher-training costs	794	1.5	1 620	2.3	2 750	3.0
Total	53 595	100.0	70 721	100.0	92 953	100.0
Tanzania (shillings)						
Recurrent costs of first-level education	941 243	86.4	999 564	86.0	1 050 514	85.8
Capital costs	69 379	6.4	76 951	6.6	82 983	6.8
Teacher-training costs	79 276	7.2	86 282	7.4	90 710	7.4
Total	1 089 898	100.0	1 162 797	100.0	1 224 207	100.0

increases substantially from one assumption to another. In fact, the high assumption is almost double the low assumption.

The case of Tanzania is somewhat special, since the population growth is assumed to be relatively high whatever the demographic projection, and the differences between the projections are slight.[1] Furthermore, the effect of this rapid population growth is increased by the improvement in the intake rate, so that total enrolment grows very fast, at a rate of 7.2 to 7.8 per cent according to projections. With such a growth rate, it is not surprising that the costs of new building and teacher training are always high.

Figure 12 shows the effect of the various population assumptions on the level of recurrent, capital and teacher-training costs. It should be noted that this graph relates to the situation in 1989. It does not show the increase between now and 1989, but merely indicates the difference in the levels of costs in 1989, taking the low population assumption as the base (i.e. 100).

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[1] Because of the assumptions adopted on the trend of fertility and mortality.

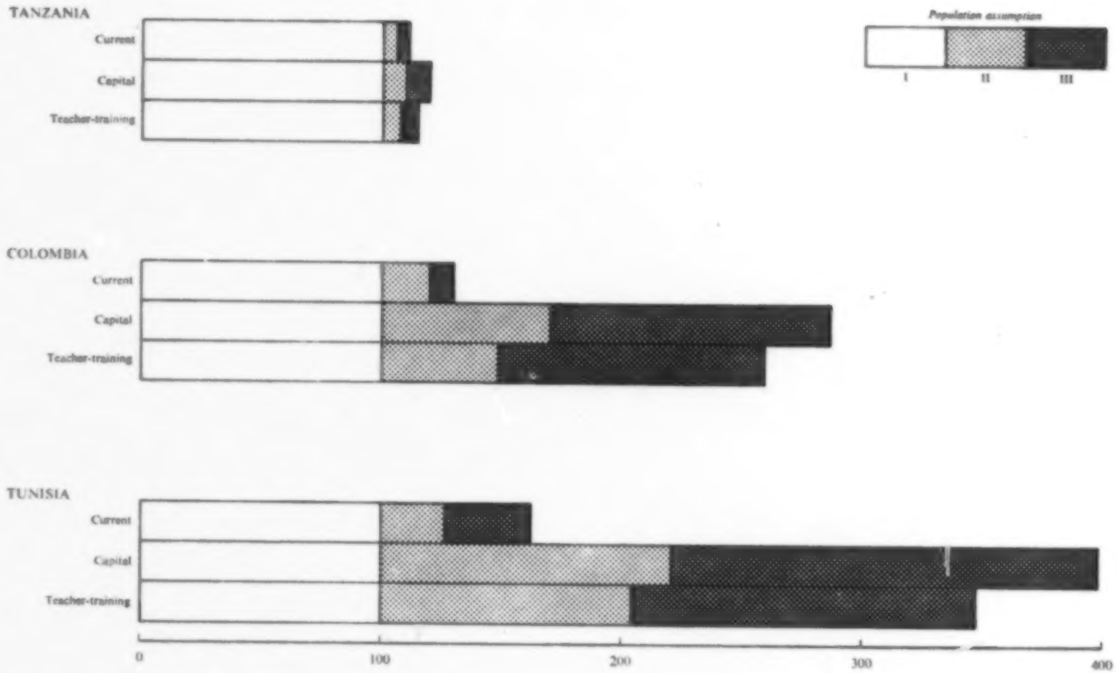

FIGURE 12. *Effects of various population assumptions on current costs, capital costs, and teacher-training costs (base: assumption I = 100)*

Except in the case of Tanzania, whose situation is relatively specific and has already been analysed, the varying sensitivity of these different costs to the three population growth assumptions is quite evident.

In Tunisia, for example, where the differences between the projections are great because of the assumptions made as to the future fall of fertility, recurrent costs increase by 60 per cent between the low and the high projection. This is a large figure, but the difference is even greater for capital costs which are, in effect, practically quadrupled in the high assumption as compared to the low one. In other words, rapid population growth has the effect not only of increasing recurrent costs by larger enrolments, but also of increasing the efforts needed to accommodate the enlarged cohorts admitted into first-level education.

IV The effect of population growth on the effort needed to develop first-level education

There are two possible approaches for measuring the effort needed to develop first-level education in the context of population growth. The first is to assess the increase in cost between the base year and the horizon year and to isolate the various components. The absolute increase in cost must also be set in the context of economic growth, in order to take into account the proportion of resources which could be allocated to education. It is for this reason that, in a second approach, we shall try to ascertain the trend between the base year and the horizon year of the proportion of GDP which should be allocated to first-level education.

Although the capital and teacher-training costs fluctuate according to the various population assumptions, and although their share in the total varies widely between one assumption and another—as we have seen in the preceding chapter—it is nevertheless true that recurrent costs absorb the predominant part; around 90 per cent, of the total. In explaining the increase in costs and the trend of their share in GDP, the analysis can be limited to recurrent costs, on the understanding that under the high population assumption the effect on capital and teacher-training costs is amplified.

The growth of recurrent costs of first-level education from the base year to the horizon year

If we compare the recurrent costs of first-level education in the base year and the horizon year (period 1968 to 1989), we find that they are multiplied by a coefficient ranging from 2.5 to 8 according to country and population assumption. The object of this section is to explain both this substantial increase and the considerable differences of situation. Table 19 shows the total increase in costs and the coefficients of increase attributable to the various influencing factors.

The different factors in the variation of total recurrent costs have been grouped under seven main headings. The coefficients attributable to each of these factors may be interpreted as the change in total costs which would have resulted had this

TABLE 19. Coefficients of increase by factor and total increase affecting costs over the period, 1968-89

	Ceylon			Tunisia			Colombia			Tanzania		
	I	II	III	I	II	III	I	II	III	I	II	III
Population growth	0.981	1.350	1.641	1.169	1.601	2.164	1.511	1.837	2.163	1.758	1.900	2.036
Higher intake rate	0.906	0.906	0.906	1.149	1.149	1.149	0.769	0.769	0.769	2.110	2.110	2.110
Improved retention rate	1.301	1.222	1.176	1.112	1.043	1.000	1.520	1.494	1.447	1.142	1.130	1.121
Improved pupil/teacher ratio	1.186	1.186	1.186	1.231	1.225	1.217	1.109	1.109	1.109	1.275	1.272	1.268
Improved qualification	1.109	1.109	1.109	1.085	1.085	1.085	1.589	1.548	1.521	1.147	1.133	1.129
Increase in salaries	1.639	1.618	1.607	1.778	1.778	1.778 [1]	1.281	1.281	1.281	1.439	1.439	1.439
Change in the ratio total costs/teacher costs	1.067	1.069	1.071	0.938	0.938	0.938	1.000	1.000	1.000	0.862	0.862	0.862
TOTAL INCREASE	2.586	3.407	4.167	3.327	4.247	5.436	3.986	4.797	5.200	7.451	8.008	8.416

NOTE The total increase is, of course, equal to the product of the coefficients of increase attributable to each of the factors which influence the increase of total costs.

I: Low population assumption
II: Medium population assumption
III: High population assumption

[1] In the case of Tunisia there was a substantial increase in salaries (more than 20 per cent) at the end of 1970. This has had to be taken into account in future projections. Because of this, salaries increase more quickly than the GDP per person of working age when calculated from the base year (1968).

factor operated in isolation. If all the factors operate simultaneously, the coefficients are multiplied by each other and the total variation is equal to the product of the coefficients. It is clear that when the coefficient is higher than unity, the corresponding factor involves an increase in cost, and a reduction when it is less than unity.

Population growth

When the base year is compared with the horizon year, the admission-age population may be slightly less (in the case of Ceylon on the low population assumption) or may be multiplied by 2.2 (in the case of Colombia and Tunisia on the high assumption). This indicates the very different effect of population growth in the various countries and on the various assumptions.

The difference between the various population projections is particularly high in Ceylon and Tunisia, moderate in Colombia, and relatively small in Tanzania. Here, even on the low population growth assumption, the admission-age population will be multiplied by 1.8. These differences are principally explained by the assumptions adopted for the fall in fertility.

These differences in population growth are reflected in full by the total costs and this accounts for their different level under the three population assumptions. Thus, in Ceylon, total costs are multiplied by 2.7 or 4.0 and in Tunisia by 2.9 or 4.8 between the low assumption and the high. As we shall see, certain other factors, though to a lesser extent, also depend on the population growth rate.

Higher intake rate

Here again, the situation is very different in the four countries. In Ceylon, and above all in Colombia, as a result of late entries, total admissions are well above the number of children reaching admission age. The absorption of these late entries will therefore have the effect of reducing costs. In Tunisia, and above all in Tanzania, the improvement in the intake rate will involve a considerable increase in costs. In fact, in the latter country, the proportion attributable to the improved intake rate is higher than that attributable to the population growth, even on the high assumption.

Improved retention rates

It is in Colombia that improvement in retention rates has the greatest effect, owing to the present high drop-out rate, especially in rural areas.

The effect of improved retention rates on the increase in enrolments differs slightly according to the population assumption. It is reflected in practice by a change in the pattern of enrolments by level of grade, with an increase in the numbers for the higher grades. The faster the population growth, the larger will be the cohorts who successively enter first-level education, thus widening the base of the school pyramid. Since the improved retention rate will mainly affect the higher grades its effect is somewhat higher in the low population assumption than in the high assumption. In practice, the real effect of improved retention rates can be measured only when admissions are constant.

Improved pupil/teacher ratio

An improvement in the pupil/teacher ratio may result either from a reduction in the size of classes (as in Ceylon and Colombia) or from changes in the number of hours taught in the different grades (as in Tunisia) or, finally, from a change in the staffing formula (as in Tanzania). In these two fields, since the changes in hours and staffing formula may differ according to the level of classes, the different population growth rates may, for the same reason as given above, influence this coefficient of increase.

Improved qualifications

The effect on total costs of improved teacher qualifications depends mainly on the variation in the salary scales for teachers with different qualifications. It also depends on the percentage of teachers judged to be insufficiently qualified and the policy followed with regard to the change in the structure of the teaching force by level of qualification. The increase in costs arising out of improved teacher qualification therefore varies from country to country. It is particularly high in Colombia, because it has been assumed that the percentage of unqualified teachers, which is at present high, will fall gradually, and that by the horizon year all teachers will be qualified.

Higher salaries

In the case studies it has been assumed that the average salary of teachers would grow at the same rate as GDP per person of working age. This growth will therefore depend on the difference between the rate of economic growth assumed and the growth of the working-age population. If this hypothesis proves correct, i.e. an increase in the salary scales at the same rate of increase as the GDP per person of working age, the cost increase resulting from the effect of economic growth on salary levels will be fairly substantial and will partly absorb the increased resources which economic growth may make available. It should also be noted that the increase indicated corresponds to the high economic growth assumption used in the case studies. It would certainly be less under a lower assumption.

Ratio of total costs to teacher costs

In the four countries studied, expenditure on teaching materials and school maintenance is relatively low and assumptions have been made as to its growth. It is important to note that the coefficient indicated in table 19 does not relate to the growth in teaching materials and maintenance costs, but to the change of the ratio between total costs and teacher costs. If teaching materials and maintenance costs grow *faster* than teacher costs, the ratio between total costs and teacher costs will rise and the coefficient will be greater than unity. Conversely, it will be less than unity in the case of Tunisia and especially in that of Tanzania, where the gradual suppression of boarding facilities at first level will to some extent reduce the growth of non-salary costs.

In conclusion, it can be said that the major growth factors common to all countries are population growth (although the magnitude of this growth varies from one assumption to another) and the increase in salaries resulting from economic growth.[1] The influence of the other factors depends on the situation of the country. In Tanzania the most important one is the increase in the intake rate; in Colombia, both the improved retention rate and the improved teacher qualification are important.

Trend of the proportion of GDP devoted to first-level education costs

As we have seen, the growth of first-level education costs will be very substantial —especially for a country such as Tanzania. This growth should, however, be compared with economic growth, in so far as that growth may provide additional resources which can be allocated to education. Another way of assessing the effort required to develop first-level education will therefore be to evaluate the proportion of GDP which should be allocated to education at that level. This approach is, to some extent, a cross-check on the analysis previously made of cost increases, and some of the variables we have already referred to will be found again, though in a different form.

It should be noted at the outset that in view of the size of the share of salaries in total costs and of the assumption we have adopted as to their trend (namely that they will grow at the same rate as the GDP per person of working age) the proportion of GDP to be allocated to the recurrent costs of first-level education varies little with the rate of economic growth. A high rate of economic growth will have the effect of pushing up salaries faster; conversely a lower rate of economic growth will result in a slower rise. Table 20 shows recurrent costs of first-level education as a percentage of GDP on two assumptions of economic growth in Tunisia and Ceylon.

The proportion of recurrent costs to GDP is higher on the low economic growth assumption than on the high assumption. But this variation is extremely slight (of the order of 5 per cent) between one assumption and the other. It is for this reason that, in the following paragraphs, we shall take into account only the high assumption of economic growth.

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[1] To the extent that the hypothesis made proves to be correct, i.e. an increase in the salary scales at the same rate of increase as the GDP per person of working age.

TABLE 20. Percentage of GDP allocated to recurrent costs of first-level education in 1989 on two assumptions of economic growth

Country	Low population assumption	Medium population assumption	High population assumption
Tunisia			
Low economic assumption	3.27	4.18	5.35
High economic assumption	3.23	4.12	5.27
Ceylon			
Low economic assumption	1.95	2.49	2.90
High economic assumption	1.88	2.40	2.80

In relation to GDP the present proportion of recurrent costs of public first-level education differs widely in the four countries studied, ranging from 1.05 per cent in Colombia to 2.76 per cent in Tunisia, that is to say, almost in the proportion of one to three.

Similarly, if the trend from 1968 to 1989 is analysed, it will also be found to be very different. In general, the proportion will increase [1] but the increase is very slight for Ceylon, moderate for Tunisia and Colombia and high for Tanzania.

A comparison between the different population assumptions also shows considerable differences; it is in Ceylon and Tunisia that the effect of the different population assumptions on the effort needed to develop first-level education is most marked. In these two countries, on the low population assumption, the proportion of recurrent costs of public first-level education will remain constant or even fall slightly. Conversely, the growth will be particularly large on the high assumption and the difference between these two assumptions may reach 60 per cent. In Tanzania, the difference is relatively small.

In order to explain the present level of the proportion of GDP allocated to recurrent costs of first-level education, its trend from 1968 to 1989, and its sensitivity to different population assumptions, it is useful to analyse the different variables which may influence this proportion.

It can be shown that this proportion (expressed as a percentage) is equal to the product of the six following variables; [2]

(*a*) the ratio between admission-age population and working-age population;

(*b*) the intake ratio in public education;

(*c*) the ratio between new entries and total enrolment in the same year;

(*d*) the pupil/teacher ratio;

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[1] Except on the low population assumption in Ceylon.

[2] A simple demonstration of this relation will be found in appendix B.

(*e*) the ratio between average teacher's salary and GDP per person of working age;

(*f*) the ratio between total recurrent costs and teacher costs.

It may seem surprising that these variables do not include the growth rate of school-age population, the growth rate of working-age population nor the economic growth rate. These growth rates are in fact taken into account, though indirectly. As we have indicated, a fall in fertility, at least over the next twenty years, will have little influence on the working-age population. It will, on the contrary, have a marked effect on the admission-age population. The difference between the growth of these two age groups will therefore be reflected in a change in the ratio between admission-age population and working-age population.

The effect of economic growth can, moreover, be indirectly estimated through the trend of the GDP per person of working age. Variations in the GDP per person of working age depend on the difference between economic growth and the growth of the working-age population.

The trend of the proportion of GDP which should be allocated to recurrent costs of first-level education, and of the six variables which may influence it between 1968 and 1989, is shown in table 21. It will be noted in particulár that the same target, namely universal first-level education, may lead to a very different percentage of GDP according to country and to population assumption. In Ceylon, on the low assumption it is only 1.9 per cent, whereas in Tanzania on the high assumption it is 5.62 per cent.

Total intake rate and intake rate in public education

In the projections it has been assumed that admission will be total in the four countries in 1989. This assumption is quite probable for Ceylon, Colombia and Tunisia, in the light of the present level of development of their first-level education. It has been adopted for Tanzania because it is the target set by the government.

While the intake rate is the same for all countries in 1989, its present level is in fact very different. It amounts to 125.2 per cent in Colombia owing to late entries; it is only 51.6 per cent in Tanzania.[1] With the absorption of late entries this ratio will fall in Colombia, whereas it should grow fast in Tanzania. Independent of other factors in the total, this increase in the intake ratio alone largely explains the considerable increase in the proportion of GDP which must be allocated to first-level education. In Tanzania it rises from 1.70 per cent in 1968 to 5.04 or 5.62 per cent in 1989, according to the population assumption adopted, whereas the growth is much less in the other countries.

In Tunisia and Ceylon, the total intake rate and the intake rate in public education are identical, since private education is negligible. In Tanzania, and especially

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[1] Including private non-aided schools.

TABLE 21. Comparative value of the principal variables influencing the proportion of GDP assigned to recurrent costs of first-level education in 1968 and 1989 in Ceylon, Colombia, Tanzania and Tunisia.

	Ceylon				Colombia				Tanzania				Tunisia			
	1968	1989			1968	1989			1968	1989			1968	1989		
		I	II	III		I	II	III		I	II	III		I	II	III
Total intake rate (percentage)	110.4	100.0	100.0	100.0	125.2	100.0	100.0	100.0	51.2	100.0	100.0	100.0	87.5	100.0	100.0	100.0
Intake rate in public education (percentage)	110.4	100.0	100.0	100.0	101.4	81.3	81.3	81.3	43.5	95.0	95.0	95.0	87.5	100.0	100.0	100.0
Admission-age population as percentage of working-age population	5.26	3.03	4.12	4.97	6.37	4.41	5.54	6.31	5.56	5.58	6.03	6.46	6.43	3.80	5.20	7.03
Average length of first-level schooling	6.4	7.2	7.2	7.2	3.50	5.05	5.05	5.05	5.30	6.60	6.60	6.60	7.0	7.20	7.20	7.20
Total enrolment/new entries ratio	5.74	7.47	7.01	6.75	3.36	4.88	4.80	4.64	4.91	5.47	5.42	5.37	6.33	7.04	6.60	6.29
Pupil/teacher ratio	33.2:1	28:1	28:1	28:1	38.9:1	35:1	35:1	35:1	49.3:1	37.1:1	37.2:1	37.4:1	52.2:1	42.4:1	42.6:1	42.9:1
Average teacher's salary as percentage of GDP per person of working age	1.74	1.93	1.93	1.93	1.75	2.75	2.69	2.64	5.43	5.73	5.67	5.65	3.62	4.72	4.72	4.72
Total recurrent costs as percentage of teacher costs	112.7	120.3	120.5	120.7	107.5	107.5	107.5	107.5	130.8	112.7	112.8	112.9	114.4	108.2	108.3	108.4
Recurrent costs of first-level education as percentage of GDP	1.97	1.88	2.40	2.80	1.05	1.48	1.79	1.94	1.70	5.04	5.35	5.62	2.75	3.23	4.12	5.27

I: Low population assumption. II: Medium population assumption. III: High population assumption.

SOURCE Calculated from the data given in the four case studies.

in Colombia, private education plays a significant part; it has, however, been assumed that its relative share will tend to fall in the future.

Ratio of admission-age population to working-age population

As we have seen, the fall in fertility, at least over the next twenty years, will affect the various age groups differently. The result is that the ratio of admission-age population to working-age population varies according to the assumption adopted for the fall in fertility.

The present age structure of the population of the four countries studied is fairly comparable and the ratio varies only from 5.24 per cent in Ceylon to 6.43 per cent in Tunisia (or a difference of the order of 20 per cent).[1] But the differences will be more marked in 1989. The assumption of constant fertility and of a gradual fall in mortality will have the effect of slightly increasing this ratio, since the fall in mortality is greater for the younger age groups than for the older ones. This is what is found on *all three* population assumptions in Tanzania and on the high assumption in Tunisia. In all the other projections a fall in fertility has been assumed and the decline in the ratio of admission-age population to working-age population will be greater or smaller according to the rate of this fall.

It is in Tunisia and Ceylon that the difference is greatest (from 3.80 to 7.03 per cent in Tunisia and from 3.03 to 4.97 per cent in Ceylon). It is this difference which explains the differences in the recurrent costs of first-level education under the different population assumptions. In practice, there is a close link between the ratio of admission-age population to working-age population and the percentage of GDP allocated to recurrent costs of first-level education, as is shown by table 22.

TABLE 22. Relation between admission-age population and working-age population and percentage of GDP allocated to recurrent costs of first-level education.

	Low population assumption	Medium population assumption	High population assumption
Ceylon			
Admission-age population as percentage of working-age population	3.03	4.12	4.97
Recurrent costs as percentage of GDP	1.88	2.40	2.80
Tunisia			
Admission-age population as percentage of working-age population	3.80	5.20	7.03
Recurrent costs as percentage of GDP	3.23	4.12	5.27

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[1] Which means that the Tunisian population is 'younger' than the population of Ceylon.

Ratio between total enrolment and new entries into first-level education

We have already analysed this variable.[1] It may simply be recalled that if admissions are constant and the different cohorts who enter first-level education during the whole of the cycle are identical, the ratio between total enrolments and new entries is equal to the average length of schooling. If, on the contrary, admissions are growing, this ratio is less than the average length of schooling and the greater the growth of admissions, the greater will be the difference. That is why, on the low population growth assumption, especially in Ceylon, the ratio between total enrolment and new entries is almost equal to the average length of schooling. On the high population assumption, it is well below.

The average length of first-level schooling is, of course, different from the official length; it is increased by repeating and diminished by drop-out. It has been assumed that retention rates will improve in all countries, so that the average length will increase between 1958 and 1989, but even in the horizon year it will remain fairly different between the four countries (5 years in Colombia and 7.2 years in Tunisia).

Pupil/teacher ratio

The pupil/teacher ratio is relatively different in the four countries studied. At present it varies from 33.2 to 1 in Ceylon to 52.2 to 1 in Tunisia. Here again, it has been assumed that the staffing formula will improve between 1968 and 1989. As we have already noted, the pupil/teacher ratio differs according to the different grades, either because drop-out reduces the number of pupils in the upper grades, or because the number of teaching hours is different in the various grades (as in Tanzania and Tunisia). The average pupil/teacher ratio for the whole of first-level education therefore depends on the pattern of enrolment by grade. A rapid population growth has the effect of widening the base of the school pyramid and consequently of widening the difference between enrolment in the various grades, to the benefit of the lower grades. The result is that the pupil/teacher ratio is slightly higher on the high assumption than on the low assumption. This difference is, however, fairly slight, as shown by the examples of Tunisia and Tanzania.

Ratio between average teacher's salary and GDP per person of working age

In all the case studies it has been assumed that salary scales will increase at the same rate as GDP per person of working age. The result is that the increase in the ratio between average salary and GDP per person of working age depends only on the improvement of teacher qualifications.

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[1] See page 37.

This ratio depends on a number of factors. It depends in particular on the country's level of economic development and the level of educational development. It also depends on the policy for civil service pay, and particularly for teachers' pay. It differs greatly from country to country. At present it varies almost in the proportion of one to three between Ceylon and Tanzania (1.74 compared with 5.43). It is mainly this difference which explains why the proportion of GDP allocated to recurrent costs of first-level education differs widely in the four countries in 1989 (table 23).

TABLE 23. Average salary as multiple of GDP per person of working age and recurrent costs of first-level education in 1989 as percentage of GDP (medium population assumption)

	Ceylon	Colombia	Tunisia	Tanzania
Average salary in relation to the GDP per person of working age	1.93	2.69	4.72	5.67
Costs as percentage of GDP	2.40	1.79 [1]	4.12	5.35

[1] This figure is not entirely significant in so far as it relates only to the cost of public first-level education and does not take into account the cost of private first-level education.

Ratio between total recurrent costs of first-level education and salary costs

This ratio is also relatively different from country to country. It depends on teaching materials and maintenance costs. It also depends on the level of social costs such as canteens or boarding facilities.

The main conclusion which can be drawn from this analysis of the different variables which affect the proportion of GDP which must be allocated to recurrent costs of first-level education is that the same objective, namely universal first-level schooling may have very different cost implications, and therefore require a very different degree of effort according to the trend of population and to the country considered. These differences are mainly explained by the trend of two key variables:

(*a*) the percentage of admission-age population in relation to the working-age population;

(*b*) average salary as a multiple of GDP per person of working age.

The ratio of admission-age population to working-age population reflects the future population trend. According to the rate of the fall in fertility this ratio may vary from 3.80 to 7.08 per cent in Tunisia, so that the proportion of GDP allocated to first-level education may range from 2.77 to 4.53 per cent (or a difference of more than 60 per cent) according to the population assumption.

The average teacher's salary as a multiple of GDP per person of working age reflects the differences which exist in the policy for teachers' pay and the relative level of pay in the different countries. It is relatively low in Ceylon (1.93) and much higher in Tanzania (5.67). This relative level naturally reacts on the proportion of GDP assigned to recurrent costs of first-level education (2.4 per cent for Ceylon and 5.35 per cent for Tanzania in 1989).

Appendixes

APPENDIX A

Table 1. Assumptions adopted on the different demographic projections (Tunisia, Tanzania, Colombia, Ceylon)

	Gross reproduction rate			Expectation of life					
	I	II	III	I		II		III	
				Men	Women	Men	Women	Men	Women
Tunisia									
1970	3.31	3.48	3.70			51.1	56.5		
1975	2.66	3.11	3.70			53.4	59.0		
1980	2.02	2.74	3.70			55.8	61.5		
1985	2.02	2.74	3.70			58.1	64.1		
1990	2.02	2.74	3.70			60.4	66.6		
Tanzania									
1970		3.20		38.9	42.1	40.2	43.4	41.4	44.6
1975		3.20		40.2	43.4	42.7	45.9	45.2	48.4
1980		3.20		41.4	44.6	45.2	48.4	48.9	52.1
1985		3.20		42.7	45.9	47.7	50.9	52.9	55.9
Colombia									
1970	3.04	3.20	3.20			56.9	60.2		
1975	2.72	3.06	3.20			59.0	62.4		
1980	2.40	2.93	3.20			61.1	64.7		
1985	2.08	2.65	3.06			63.8	67.1		
1990	1.76	2.37	2.93			66.0	69.4		
Ceylon									
1970	2.20	2.36	2.57			62.7			
1975	1.60	2.14	2.53			64.4			
1980	1.36	1.90	2.41			66.1			
1985	1.26	1.62	2.04			67.8			
1990	1.21	1.38	1.54			69.5			

NOTES
I: Low assumption
II: Medium assumption
III: High assumption

SOURCE Tunisia: D.B. Johnson, *Population of Tunisia, estimates and projections, 1967-2000*, op. cit.

Tanzania: United Nations, Population Division, *Projection of the population of Tanzania 1965-85*, Unpublished document.

Colombia: J. Arevalo and A. Ortega, *Colombia: Proyecciones de población por sexo y grupo de edades, 1965-2000*, Santiago de Chile, CELADE, 1968.

Ceylon: R. Lesthaeghe and P.S.K. Chi, *Ceylon population projection*, Brown University, Colombo.

TABLE 2. Comparative growth rate of school-age population and working-age population

	1970-75			1975-80			1980-85			1985-90		
	I	II	III	I	II	III	I	II	III	I	II	III
Colombia												
Population 5-9	2.7	3.6	3.6	1.8	3.5	3.9	1.8	3.0	4.1	1.4	2.3	3.9
Population 10-14	3.2	3.2	3.2	2.7	3.6	3.6	1.8	3.6	3.9	1.8	3.0	4.1
Population 15-59	3.7	3.7	3.7	3.7	3.7	3.7	3.5	3.7	3.7	3.4	3.7	3.8
Tanzania												
Population 5-9	2.3	2.7	3.0	2.9	3.3	3.6	2.9	3.3	3.6	2.9	3.4	3.6
Population 10-14	2.6	2.7	2.9	2.4	2.7	3.1	2.9	3.4	3.8	2.8	3.5	3.9
Population 15-59	2.6	2.7	2.7	2.6	2.7	2.9	2.6	2.8	3.0	2.6	3.1	3.3
Ceylon												
Population 5-9	0.6	0.6	0.6	0.5	1.9	2.6	-0.8	1.9	3.3	-0.2	1.8	3.1
Population 10-14	2.6	2.6	2.6	0.6	0.6	0.6	0.5	1.9	2.6	0.8	2.0	3.3
Population 15-59	2.9	2.9	2.9	2.7	2.7	2.7	2.4	2.4	2.5	2.1	2.4	2.5
Tunisia												
Population 5-9	2.0	2.2	2.5	-0.6	1.2	3.1	-0.4	2.1	4.5	1.3	3.3	4.8
Population 10-14	2.5	2.5	2.5	2.1	2.3	2.6	-0.5	1.2	3.1	-0.4	2.1	4.6
Population 15-59	3.4	3.4	3.4	3.4	3.4	3.4	3.3	3.3	3.4	2.6	2.9	3.3

NOTES
I: Low population assumption
II: Medium population assumption
III: High population assumption

SOURCE See appendix, table 1.

TABLE 3. Trend of ratio of school-age population to working-age population

	1970			1980			1985			1990		
	I	II	III	I	II	III	I	II	III	I	II	II
Ceylon												
Population 5-14	3 170	3 170	3 170	3 407	3 673	3 817	3 365	4 029	4 435	3 287	4 410	5 193
Population 15-59	6 838	6 838	6 838	9 010	9 010	9 010	10 115	10 155	10 176	11 222	11 384	11 481
Percentage	46.4	46.4	46.4	37.8	40.8	42.4	33.3	39.7	43.6	29.3	38.7	45.2
Colombia												
Population 5-14	6 280	6 280	6 280	8 086	8 857	8 920	8 826	10 409	10 900	9 551	11 874	13 289
Population 15-59	10 810	10 810	10 810	15 558	15 558	15 558	18 500	18 675	18 675	21 672	22 437	22 520
Percentage	58.1	58.1	58.1	52.0	56.9	57.3	47.7	55.7	58.4	44.1	52.9	59.0
Tanzania												
Population 5-14	3 481	3 496	3 512	4 464	4 634	4 804	5 158	5 462	5 759	5 932	6 462	6 918
Population 15-59	6 762	6 778	6 793	8 730	8 842	8 947	9 919	10 153	10 378	11 306	11 921	12 194
Percentage	51.5	51.6	51.7	51.1	52.4	53.7	52.0	53.8	55.5	52.5	54.2	56.7
Tunisia												
Population 5-14	1 455	1 455	1 455	1 692	1 781	1 896	1 655	1 933	2 294	1 690	2 212	2 889
Population 15-59	2 494	2 494	2 494	3 481	3 481	3 481	4 098	4 098	4 109	4 643	4 729	4 842
Percentage	58.3	58.3	58.3	48.6	51.2	54.5	40.4	47.2	55.8	36.4	46.8	59.7

NOTES

I: Low population assumption
II: Medium population assumption
III: High population assumption

SOURCE See appendix, table 1.

APPENDIX B

Identification of the principal variables which determine the proportion of GDP allocated to recurrent costs of first-level education

It is not the purpose of this appendix to give the detailed list of equations from which it is possible to measure the effects of population growth on the costs of first-level education and teacher training. This question is dealt with elsewhere in this book.[1] Its only object is to identify, from a set of simple equations the key variables which determine the proportion of GDP which should be allocated to recurrent costs of first-level education.

1. Admissions = Intake rate × Admission age population [2]
   ADMI = INRA × ADPO

2. Enrolment = Admissions × Average length of primary schooling [3]
   ENRO = ADMI × ALPS
   = INRA × ADPO × ALPS

3. Teachers = Enrolments × Teacher/pupil ratio
   TEAC = ENRO × TPRA
   = INRA × ADPO × ALPS × TPRA

4. Teacher costs = Teachers × Average salary [4]
   TECO = TEAC × AVSA
   = INRA × ADPO × ALPS × TPRA × AVSA

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1. See *Model*, p. 279.
2. The intake rate is defined as the ratio of new entries to the official admission-age population. When late entries are numerous this ratio may exceed 100 per cent. The question of late entries is discussed in detail in the model cited above.
3. This equation is strictly accurate only when admissions are constant for the different cohorts which make up primary enrolments. When admissions are rising (or falling) the average length must be adjusted. It then becomes the ratio between new entries and total enrolments. This question is discussed in detail in the model cited above.
4. Average salary depends on a number of factors including the qualification profile of teachers, the differential between minimum and maximum salary for teachers of different categories, the structure of teachers by length of service and its trend over time. This question is discussed in detail in the model cited above.

5\.
$$\frac{\text{Teacher costs}}{\text{Gross domestic product}} = \text{Teachers} \times \frac{\text{Average salary}}{\text{Gross domestic product}}$$

$$\frac{\text{TECO}}{\text{GDP}} = \text{INRA} \times \text{ADPO} \times \text{ALPS} \times \text{TPRA} \times \frac{\text{AVSA}}{\text{GDP}}$$

Equation 5 will not change if it is divided and then multiplied by the working-age population (WAPO). This equation can then be written as follows:

$$\frac{\text{TECO}}{\text{GDP}} = \text{INRA} \times \frac{\text{ADPO}}{\text{WAPO}} \times \text{ALPS} \times \text{TPRA} \times \frac{\text{AVSA}}{\text{GDP}} \times \text{WAPO}$$

or alternatively:

$$\frac{\text{TECO}}{\text{GDP}} = \text{INRA} \times \frac{\text{ADPO}}{\text{WAPO}} \times \text{ALPS} \times \text{TPRA} \times \frac{\text{AVSA}}{\text{GDP/WAPO}}$$

6. Recurrent costs = Teacher costs + Non-salary costs

$$\begin{aligned}
\text{RECO} &= \text{TECO} + \text{NSCO} \\
&= \text{TECO}\left(1 + \frac{\text{NSCO}}{\text{TECO}}\right) \\
\frac{\text{RECO}}{\text{GDP}} &= \frac{\text{TECO}}{\text{GDP}}\left(1 + \frac{\text{NSCO}}{\text{TECO}}\right) \\
&= \text{INRA} \times \frac{\text{ADPO}}{\text{WAPO}} \times \text{ALPS} \times \text{TPRA} \times \frac{\text{AVSA}}{\text{GDP/WAPO}} \times \left(1 + \frac{\text{NSCO}}{\text{DECO}}\right)
\end{aligned}$$

As can be seen, the level of recurrent costs in relation to GDP depends on six key variables:

1. INRA = intake ratio
2. $\frac{\text{ADPO}}{\text{WAPO}}$ = admission-age population as percentage of working-age population
3. ALPS = average length of first-level schooling
4. TPRA = teacher-pupil ratio
5. $\frac{\text{AVSA}}{\text{GDP/WAPO}}$ = average salary as multiple of GDP per person of working age
6. $\frac{\text{NSCO}}{\text{TECO}}$ = non-salary costs as percentage of teacher costs

Ceylon: a case study

Jacques Hallak

Contents

General information on Ceylon 77
Introduction 79
I. Progress of the educational system 81
The growth of the gross domestic product 81
Educational expenditure 82
Financing the educational system 84
II. The development of first-level education 86
The structure and quantitative expansion of first-level education 86
The structure and qualification of the teaching force 88
The financial aspects of first-level education 89
III. The impact of demographic growth on the development of education during the next two decades 92
Ceylon population projection 92
First-level school enrolments 95
Teacher requirements 98
IV. The impact of demographic growth on the cost of education during the next two decades 106
Cost of first-level education 106
Cost of teacher training 109
Conclusion 111
Appendix 115

EXPLANATORY NOTE

This report has been prepared from materials supplied by the Ministry of Education and from the findings of a research mission to Colombo carried out during May 1970. The Institute is very grateful to Mr. J. Alles, Deputy Director-General of Education, Mr. Warnasurya, Deputy Director-General of Education, Mr. W. D. Fernando, Regional Director of Education and Mr. Wijegoonesekera, and to numerous members of the Ministry of Education for their total co-operation and assistance.

This report was prepared during 1970 and, therefore does not include the changes which have occured in the Ceylonese system during 1971.

General information on Ceylon

THE COUNTRY

Ceylon has an area of approximately 25,000 square miles, three quarters of which lie in the dry area where the soil is poor. Three of the four million acres already under cultivation are in the wet zone.

THE PEOPLE

There are 12.2 million inhabitants, of which 71 per cent are Singalese, 21 per cent Tamils, the remainder being Muslims and Burghers. The population increases at 2.4 per cent per annum; the density is about 480 per square mile.

THE ECONOMY

The gross domestic product (GDP) at current market prices averages $150 *per capita* (the official rate is $1 US = Rs.5.95). The growth of real income over

TABLE 1. Gross domestic product at factor cost, 1969 (millions of rupees)

Industry	Amount	Percentage
Agriculture	3 801	34.8
Mining	51	0.5
Manufacturing	1 274	11.7
Construction	655	6.0
Electricity	18	0.2
Transport and communications	1 091	10.0
Trade	1 715	15.7
Banking and insurance	148	1.4
Ownership and dwelling	375	3.4
Administration and defence	469	4.3
Services	1 327	12.0
TOTAL	10 924	100.0

the period 1968-69 averaged 3.1 per cent. The economy of the country depends heavily upon agriculture, which constitutes as much as 34.8 per cent of the GDP. There is, as yet, little industry, its share of GDP being only 11.7 per cent, but some rapid expansion of manufacturing has recently taken place.

EDUCATION

The literacy rate in Ceylon is high; excluding children in the 0-4 age group, 80 per cent of the population is literate.

Introduction

Educational systems of the developing world have expanded at a strikingly high rate during the last fifteen years. The demand for further expansion is still enormous, since all countries aim at eliminating illiteracy and providing first-level education to the whole school-age population.

Our assumption here is that high rates of demographic growth in developing countries make it more difficult for these nations to reach their educational targets. Or, to put it differently, increasing the school enrolment ratio is more difficult and more expensive in the case of rapidly growing populations than in the case of stable populations.

To test this hypothesis and to illustrate the impact of demographic growth on the long-term development of educational systems, four case studies have been undertaken on Colombia, Ceylon, Tanzania and Tunisia. The purpose of this report is to describe the analysis made on Ceylon with a view to estimating the cost of first-level schooling in 1979 and 1989, using three population projections with different trends of fertility rates.

The reason for concentrating on first-level education has been discussed at great length in another report of this series.[1] In our view, no change in the fertility rate during the coming years will have its full effect on second-level education before the early nineties, and on third-level education before the late nineties. This goes beyond the twenty-year period of projections dealt with in the study, i.e., 1969 to 1989. Consequently, we shall estimate the impact of population growth on educational expenditures by confining ourselves to first-level schooling and first-level teacher training.

Let us state at the outset that this report is *not* aimed at forecasting future expenditure on first-level education. It is not a long-term plan for first-level education, nor is it a set of projections which can be used by Ceylonese planners as a basis for their own forecasts. *It is no more than an exercise in sensitivity analysis which helps in estimating very broadly the cost for alternative hypotheses regarding demographic growth.* Thus, although the figures are related to Ceylon, they are of significance for any other country.

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[1] See page 14.

There are, however, two major advantages in using the Ceylonese figures for making this analysis.

Firstly, a national family-planning programme has been in operation in Ceylon since 1965. Its stated objectives are to reduce the birth rate from 33 to 25 per 1,000 by 1975 so as to decrease the population growth from 2.4 per cent to 1.6 per cent. Thus, the assumptions made in the study concerning the reduction of the fertility rate are not entirely imaginary and correspond, in some respects, to what Ceylon might actually experience.

Secondly, the school enrolment ratio [1] in Ceylon is over 100 per cent for grade 1 classes; the intake ratio of first-level education (i.e., the proportion of the children admitted to school [2] in the 6-year-old group) is already around 100 per cent, and any change in the school-age population will automatically affect first-level school enrolments. Thus the effect of demographic growth on the development and cost of education will be easy to assess with the data on Ceylon, since there is not, as in the case of other developing countries, a conjunction of two phenomena; the demographic increase and the increase in the enrolment ratio.

The report is divided into four parts. Part I describes the progress of the educational system in Ceylon within the general economic setting. Part II is more specifically devoted to the development of first-level education. Part III examines the consequences of three alternative demographic projections on first-level school enrolment and teacher requirement, by paying due attention to the problem of teacher training. Part IV analyses the cost of the various alternatives, and deals separately with the salary cost, non-salary recurrent cost, and capital cost for first-level education and teacher training.

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[1] Including repeaters.

[2] At the ages of five and six.

I Progress of the educational system

In 1959, the Ceylon government published a ten-year plan which had, in fact, very little operational significance. The country's planning was reorganized in 1965, and special efforts for development planning followed. By taking stock of the development of Ceylon's economy since 1960, and in more detail since 1965, we shall try to assess the effort made by the country for the development of education.

The growth of the gross domestic product

According to the 1969 estimate, the gross domestic product was equal to Rs.10,596 million in 1968. The total population is estimated at about 12 million inhabitants. The gross domestic product *per capita* is thus around $149 US (the official rate being Rs.5.95 to the US dollar).

The target set by the Ministry of Planning implies an average annual growth rate of real income of 4.5 per cent during the period 1967-77.

For the first half of the 1960s, the average rate of growth of GDP is estimated at about 3.6 per cent per annum. In the following years, Ceylon managed to raise the rate to an average of 6 per cent per annum.

As in many developing countries, the public sector constitutes a very large part of total GDP (20 to 25 per cent). Throughout the period starting from 1960-61, the government has been reasonably successful in mobilizing revenue; Rs.1,481 million in 1960-61, and Rs.2,773 million, according to the 1969-70 budget estimates.

An analysis of the development of public expenditure shows the increased share of capital outlay. Until 1964-65, only 14 per cent of the aggregate increase in total outlays went into additional capital expenditure. Since then, the share has always been more than 20 per cent. In addition, the government succeeded, at least for a time, in reducing the large share of resources traditionally devoted to social purposes. Whereas such expenditure averaged about 58 per cent of the total before 1965, the government has made a determined effort to lower this share, and succeeded for a time in bringing it down to 51 per cent. However, it proved difficult to sustain this rate, and in subsequent years it increased, reaching 54 per cent in 1968-69. On the other hand, current and capital expenditure on economic services increased from its pre-1965 level of around 20 per cent to about 25 per cent during the period from 1965-66 to 1967-68 and to as much as 30 per cent in 1968-69.

A broad comparison between total government revenue and expenditure shows a net deficit throughout the recent period. This deficit, which was of the order of Rs.400 million a year until 1965, has increased at a very high rate and is estimated at Rs.764 million for 1968-69.

Educational expenditure

Current expenditure

GOVERNMENT RECURRENT EXPENDITURE AND GDP

Total educational recurrent expenditure has increased steadily during recent years. Considering only public sources of financing and the budget of the Ministry of Education—the private contribution being a very minor proportion of the total—the trend of total educational recurrent expenditure is as shown in table 2.

From 1964-65 to 1968-69, the government succeeded in limiting the increase in recurrent expenditure devoted to education to a rate lower than the rate of growth of GDP. However, according to the estimates of the Ministry of Education and assuming an annual rate of growth of GDP of 4.5 per cent, the recurrent expenditure on education is likely to increase faster than GDP up to 1976-77 and to be of the order of 4.5 per cent.[1]

DISTRIBUTION OF RECURRENT EXPENDITURE AMONG THE VARIOUS LEVELS OF EDUCATION

Table 3 indicates the evolution of recurrent expenditure by level of education; available data do not permit a broader distinction between general education for the first and second levels. (Later in this report we shall make separate estimates of the expenditure for first-level education.)

As can be readily seen from the table, while public expenditure for all levels increased over the period 1952-66 by 183 per cent, it increased by 178 per cent in general first and second levels, and by only 128 per cent in second-level technical education. In the case of third-level education, the increase is strikingly high, 330 per cent; expenditure on third-level education, which represented less than 3.6 per cent of the total in 1952, exceeded 5.4 per cent in 1966, a significant shift in the distribution of the educational expenditure.

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[1] For first-and second-level education only, the proportion of GDP would amount to 3.46 per cent.

TABLE 2. Total educational recurrent expenditure and GDP (millions of rupees)

Year	Recurrent educational expenditure	GDP at market prices	Per cent of GDP
1963-64	309.3	7 775	3.98
1964-65	324.7	8 013	4.05
1965-66	329.3	8 334	3.95
1966-67	340.0	9 052	3.76
1967-68	396.6	10 596	3.74
1968-69 (estimates)	415.2	11 770	3.53
1969-70 (estimates)	470.0	12 300	3.82
Long-term projections[1]			
1969-70	387.5	12 300[2]	3.14
1970-71	416.6	12 850	3.24
1971-72	447.3	13 420	3.33
1976-77	579.5	16 772	3.46

1. First- and second-level general education government schools only.
2. Estimated 4.5 per cent per annum.

SOURCE Central Bank of Ceylon

J. Alles, 'Ceylon: costing first- and second-level general education', in *Educational cost analysis in action: case studies for planners*, Vol. I, Paris, Unesco: IIEP, 1972.

O. P. Wijegoonesekera and J. Alles, *An analysis of the recurrent costs of education for 1968-69 and recurrent cost projections of first- and second-level general education programmes* (Ministry of Education, Colombo, internal document).

GOVERNMENT EXPENDITURE ON EDUCATION AND TOTAL GOVERNMENT EXPENDITURE

Another way of assessing the relative effort made by Ceylon to finance education is by comparing recurrent expenditure on education with total recurrent expenditure financed by the government (table 4).

TABLE 3. Recurrent expenditure on education by levels, 1952-66 (thousands of rupees)

Year	First and second level general	Second level technical	Third level university	Total
1952	114 664	1 063	4 285	120 012
1956	162 681	850	6 516	170 047
1960	269 716	1 291	10 771	281 778
1962	271 984	1 696	13 059	286 739
1964	308 052	1 764	14 932	324 748
1965	311 301	2 025	16 000	329 326
1966	319 119	2 426	18 466	340 011

SOURCE J. Alles, S.V. de Silva and F.W.W. Kulatunga, *Financing and cost of first- and second-level education in Ceylon 1952-64 and 1965-66*, Colombo, Division of Secondary Education, Ministry of Education, 1967.

Recurrent expenditure on education grew from Rs.264 million in 1960-61 to Rs.415 million in 1968-69, or by more than 6 per cent per annum, a significant increase. However, the total government recurrent expenditure increased at an even higher rate over the same period. Thus, since the mid-1960s, the government policy for limiting its budget allocations to the social sector seems to have been successful.

The share of education decreased from about 18 per cent in 1965 to about 16 per cent in 1969, as table 4 shows.

TABLE 4. Recurrent educational expenditure and total government recurrent expenditure (millions of rupees)

	1960-61	1964-65	1966-67	1967-68	1968-69
Education	264	328	340	397	415
Total	1 471	1 890	2 093	2 383	2 610
Education as percentage	17.9	17.4	16.2	16.7	15.9

SOURCE Central Bank of Ceylon, *Annual report 1968*, Colombo, 1969.

Capital expenditure

Table 5 compares the capital outlay in the educational sector with the total gross domestic capital formation (GDCF) and the public capital expenditure during recent years.

Between 1964 and 1966 capital expenditure on education decreased both in absolute terms and as a proportion of gross domestic capital formation and of total government capital expenditure. Only 3.8 per cent of the capital expenditure was devoted to education in 1966, as against 10.0 per cent in 1964.

A change occurred in 1968; the 1969 budget estimate shows an increase of 64 per cent in capital expenditure on education, which should thus reach 4.8 per cent of total public capital expenditure.

Financing the educational system

The organization, administration, control and supervision of education are the province of the central government.

For all levels, the central government is by far the most important source of finance, the funds being annually voted by parliament. Additional funds (by way of fees) may be assumed to be negligible as far as recurrent costs are concerned.

Although the main responsibility lies with the Ministry of Education, other departments and ministries also contribute to the financing of education. They include the Ministry of Health (around Rs.8 million in 1966-67), the Ministry

TABLE 5. Capital expenditure (millions of rupees)

Year	Capital expenditure on education (all levels) A	Total GDCF B	A as percentage of B	Public capital expenditure [1] C	A as percentage of C
1964	48.5	1 113	4.4	483	10.0
1965	31.0	1 013	3.1	537	5.8
1966	22.0	1 195	1.8	597	3.7
1967	26.4	1 377	1.9	699	3.8
1968	33.4	1 668	2.0	792	4.2
1969	31.8	2 232	1.4	912	3.5
1970	52.2	—	—	1 081	4.8

[1] This includes 'acquisition of financial assets'.

SOURCE Central Bank of Ceylon, *Annual report 1969*, Colombo, 1970.

of Agriculture (Rs.3 million of recurrent expenditure) and the Ministry of Labour (Rs.2.5 million of recurrent expenditure). A rough estimate of expenditures of departments other than the Ministry of Education gives a total of Rs.22 million for recurrent expenditure and Rs.3 million for capital expenditure in 1966-67.

In addition, according to the Ministry of Education's own estimates, other public sources of financing outside the budget contributed some Rs.20 million in 1966-67.

No significant contributions are derived from local authorities. Insofar as foreign aid is concerned, Ceylon receives support in the form of grants. No estimates are available of recurrent expenditure financed by aid, but according to the Ministry of Education, it would represent some 5 per cent of the educational budget. As for capital expenditure, up to 30 September 1967, around Rs.1,133 million were channelled to Ceylon, particularly from the United States, Australia, New Zealand and Canada. Private sources are numerous but their share is very small. Among general first and second levels there is still a small number of private schools with about 6 per cent enrolment and a correspondingly small proportion of expenditure. The voluntary sums collected annually as 'facility fees' do not exceed Rs.2 million. As for capital costs, the contribution made by the denominational schools for first and second levels may be significant, but no systematic records are available to provide an accurate estimate. At the third level, a few private institutions administer programmes, with fees levied from students, but the contribution of these institutions to third level education is estimated at approximately 5 per cent.

II The development of first-level education

The main features of the development of first-level education can be seen by examining the trend of enrolments, the structure and qualifications of the teaching staff, and the cost of first-level education.

The structure and quantitative expansion of first-level education

Until 1964, the first-level in the Ceylon educational system referred to elementary education of nine years' duration for the 5 to 14 year age group. More specifically grades 1A and 1B were called pre-first-level; grades 2, 3, 4 and 5 first-level; and grades 6, 7 and 8 second level, lower stage. In 1964 the pre-first-level school system was reduced by one year, and first-level education became of eight years' duration instead of nine. In September 1966, proposals for reform of general and technical education were presented to parliament by the Minister of Education and Cultural Affairs. According to the new pattern of the school system, first-level education corresponds to grades 1 to 7 (age group 5+ to 12+), and second-level general education to grades 8 to 12 (age group 12+ to 17+). Grade 8 is, normally, the final grade in the first-level, yet it is planned within the second-level. This has been done to provide for appropriate articulation of the grade 8 'output' with diversified programmes from grade 9 onwards.[1] Figure 1 gives a schematic representation of the evolution of the first-level school system.

At present, schooling for first-level pupils is provided in approximately 9,000 first-level schools distributed reasonably evenly over the island. As in many other countries, there is a marked heterogeneity in the availability of physical plant; even where physical plants are of a comparable type, there are significant variations in standards of education. The variations depend to some extent on rural/urban factors and on the socio-economic level of the communities in which the schools are located.

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[1] After the elections in 1970, the new government decided to consider grade 8 as belonging, strictly speaking, to the first level.

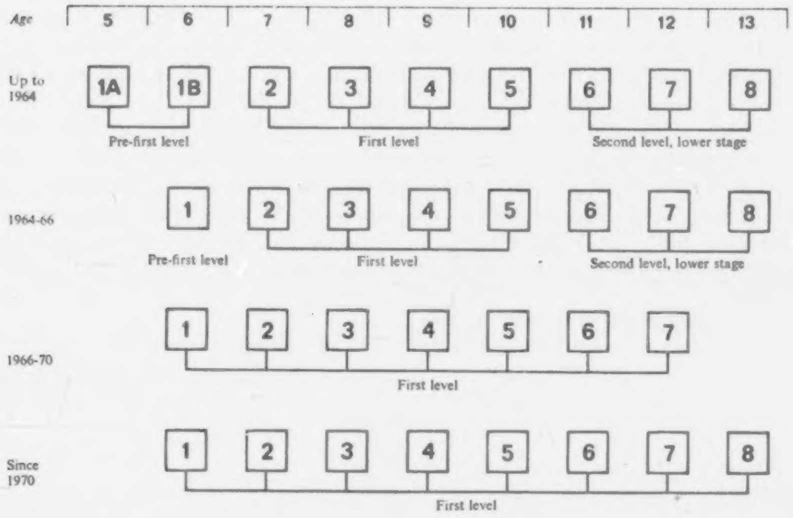
Age
5
6
7
8
9
10
11
12
13
Up to 1964
1A
1B
2
3
4
5
6
7
8
Pre-first level
First level
Second level, lower stage
1964-66
1
2
3
4
5
6
7
8
Pre-first level
First level
Second level, lower stage
1966-70
1
2
3
4
5
6
7
First level
Since 1970
1
2
3
4
5
6
7
8
First level

FIGURE 1. *Schematic representation of first-level school system*

In line with other developing countries, enrolment in the first-level of general education has increased rapidly during the last fifteen years. In 1955, 1,530,500 pupils were enrolled in grades 1 to 8; in 1969, the corresponding number was 2,298,000. The net increase is thus approximately 50 per cent over the period. At the same time, the efficiency, roughly measured by the retention rate, seems to have been improving slowly, as shown in table 6.

TABLE 6. Retention rates, 1960-65

	1960	1961	1962	1963	1964	1965
Grade 1A	100.0	100.0	100.0	100.0	100.0	100.0
Grade 1B	75.4	74.3	76.1	90.8	88.3	86.2
Grade 2	69.7	69.1	69.1	74.8	88.2	73.8
Grade 3	63.6	64.5	64.3	65.7	70.5	73.3
Grade 4	60.8	57.3	58.0	58.0	59.3	60.7
Grade 5	52.3	54.2	50.0	50.8	52.7	51.8
Grade 6	45.8	47.4	48.4	44.3	45.0	44.8
Grade 7	35.1	39.7	40.9	40.5	38.3	39.0
Grade 8	30.5	32.0	36.1	34.3	38.9	35.6

SOURCE J. Alles, op. cit., table 8.

Another interesting feature of first-level enrolment is the profile of grade 1 intake with reference to the official minimum admission age of 5 years.

In 1967, age-grade classifications were worked out on the basis of data given by school census. The enrolment in grade 1 was 419,789. The official age of enrolment is 6 years, but only 47.2 per cent of the pupils enrolled belonged to this age group. Many pupils are below the official entry age; thus 26.3 per cent of grade 1 enrolments are only 5 years old. In addition, because of high repetition rates, 18 per cent of the enrolments are pupils aged 7, and 8.3 per cent are pupils aged 8 or more. It is, therefore not surprising that the ratio of enrolments in grade 1 to the total 6-year-old population was 126 per cent in 1967. (See table 7.)

TABLE 7. Age distribution in grade 1 in 1967

Age	Enrolment	Percentage	Percentage of corresponding age group
5	110 768	26.3	33.0
6	198 978	47.4	59.9
7	75 447	18.0	23.0
8 and over	34 596	8.3	
TOTAL	419 789	100.0	(age 6) 126.3

The first-level participation rate (or enrolment ratio) averaged 91 per cent in 1969. It is one of the highest in Asia and has increased significantly during the past ten years. However, it is expected to increase further with the improvement of the retention rate, as the enrolment ratio is already over 120 per cent in grade 1.

The development of the general education system during the next decade has been examined in a short-term plan (1966-70) and in terms of a ten-year perspective extending to 1977. More recent projections up to 1980 are being prepared by the Ministry of Education, taking into account school census returns, demographic projections and socio-economic hypotheses. Two main assumptions concerning first-level education should be noted: (i) an improvement in the distribution of the age groups in grade 1, to include less and less pupils of 5, 7 and 8 years of age and more and more of 6-year-olds, whose ratio would increase from 64.4 per cent in 1969 to 75.0 per cent in 1980; (ii) an improvement in the retention rate, which would lead to an average in grade 8 schools of 47.4 per cent in 1980, as against 36.8 per cent at present. [1]

The structure and qualification of the teaching force

The number of teachers in the different kinds of first-level classrooms is of the order of 65,000, a very large proportion of which is still unqualified despite efforts made to improve their qualifications, especially by increasing the output of non-specialist teacher-training colleges. There are twenty-five such colleges, of which fifteen are for teaching through the medium of Singalese, and ten with Tamil.

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[1] See Ministry of Education, *Perspectives for the development of second-level general education 1970-80*, Part II, Colombo, Division of Secondary Education, 1970.

Owing to the very large number of untrained teachers and the inability of the training colleges to meet the demand for training, the National education commission recommended in 1965 that a new category of 'preliminary trained teacher' be recognized. To qualify for recognition, an applicant must have four credits in appropriate subjects at 'O' level, have taught for at least one year, taken in-service courses of fifty hours in each of the four subjects, and passed written and practical examinations on methods of teaching them. Pupil-teachers who qualify as 'preliminary trained' are eligible to take the training college entrance examination. Although this category of teachers has not yet been created, students may already follow this sequence: selective examination to become a pupil-teacher; entrance examination to a training college; two-year training course, and final examinations. After three years of satisfactory service, a second-class teacher may be promoted to the grade-trained teacher (first class).

During the period 1963-69, the teacher staffing in the schools remained relatively steady and the average pupil/teacher ratios for the first level were in the neighbourhood of 33 to 1 in 1963 and 1969.[1]

Until recently teachers received a number of allowances in addition to their salaries. In 1969 a new system of 'consolidated salaries' was introduced and no further allowances have been granted. The distribution of the teaching force by salary scale and level of qualification in first-level education is given in the appendix, table 1.

The financial aspects of first-level education

Recurrent cost

It should be noted at the outset that the structure of accounts of the government of Ceylon and the mode of budgeting as practised do not permit a direct calculation of separate recurrent costs for first- and second-level general education. Nor is it possible to separate them by using internal criteria alone. Since it is important to ascertain the individual cost of these two levels, attempts have been made to do so on the basis of a selected number of assumptions regarding the comparative unit cost between first and second levels by using results of sample cost surveys and by making alternative assumptions about the teacher salary component of recurrent cost.

According to a survey carried out during the early 1960s, the ratio of unit recurrent cost of second-level to first-level education is about 2 to 3. Using more recent information on the distribution of teachers by salary level and examining the other elements of the recurrent cost, one can estimate the ratio as approximately 3 to 2 in 1969. It is thus possible to estimate their recurrent cost for each level separately (see appendix, table 2).

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[1] See table 15.

Table 8 shows that from 1963 to 1966 recurrent expenditure on first-level education decreased slightly from Rs.217.8 million to Rs.210.8 million.

TABLE 8. Expenditure on, and cost per pupil of first-level education (grades 1-8 government schools only)

Year	Cost per pupil (rupees)	Enrolment (thousands)	Expenditure (millions of rupees)
1963	106.1	2 052.5	217.8
1966	102.8	2 050.6	210.8
1968	103.1	2 142.9	220.9
1969	102.8	2 172.6	223.3

SOURCE IIEP estimates.

From 1963 to 1969, the recurrent expenditure remained almost stagnant (with only a 6 per cent increase over the period). Such a trend can easily be explained by examining the trend of enrolments and of the unit cost. From 1963 to 1967 there was a decrease in enrolment because of the reduction of the pre-first-level school system from two years to one. Simultaneously, there was a slight decrease in unit cost. Since 1967, enrolment has been increasing very slightly, whilst cost per pupil has been decreasing slowly.

TABLE 9. Indices of unit cost and enrolment in first-level education

Year	Unit cost	Enrolment	Year	Unit cost	Enrolment
1963	100.0	100.0	1968	97.2	104.4
1966	96.6	100.2	1969	96.9	105.8

The evolution of the cost per pupil is parallel with that of teachers' salaries, since the latter constituted about 85 per cent of the total recurrent cost in both first and second levels in 1969.

Capital cost

With regard to capital cost, three items are normally distinguished in the so-called 'module' system which is followed by those responsible for school building: land; classrooms; other rooms. A school with six classrooms and 240 pupils costs Rs. 54,000, distributed as follows: land, Rs. 2,500; classrooms, Rs. 24,000; other rooms, Rs. 27,500. Thus the cost per pupil-place averaged Rs. 225 in 1964-65. More recent information gives an average cost of Rs. 280 (1969-70).

The financing of first-level education

Pupils in the first-level in Ceylon receive ' free education ', i.e. they do not pay tuition fees. While a minimum midday meal is provided, books and other supplementary items are not available free of charge.[1] A very small percentage of pupils receive bursaries which partially cover such needs, and a further small percentage of needy children obtain assistance by way of grants. The total amount of fees collected does not exceed Rs. 2 million, which are used mainly for sports and other co-curriculum activities. The contribution of local authorities is negligible. Some suggestions for a more active role by local communities have been made from time to time, but so far no appropriate legislative machinery has been set up.

For all practical purposes, government revenue has been the sole source of educational finance (funds voted by parliament for the specific purpose of education in the annual Appropriation act).

In addition to government schools, there are three categories of first-level schools: ' private non-fee levying ', ' private fee-levying ' and ' estate schools '. But altogether these schools play a very minor role in terms of enrolment (5 per cent of the total) and in terms of raising non-government funds to education. For the sake of simplicity, we will not make separate estimates for these schools in the enrolment and cost projections made in Parts III and IV of the present study.

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[1] A few free textbooks in the core subjects are given to needy children; in 1969-70 the amount spent on this was Rs. 250,000.

III The impact of demographic growth on the development of education during the next two decades

We shall now describe step by step the methods followed and the assumptions underlying the long-term projections of the development of first-level and teacher-training education up to 1979 and 1989.

It may be argued that it would perhaps have been more satisfactory not to make new projections for both 1979 and 1989, but simply limit the study to discussing the available 1977 projections of the Ministry of Education prepared in 1969 and in 1970 [1] and to exploring the horizon in 1989. But such an approach can be misleading insofar as the work of the ministry is in fact a forecasting study, whereas this report is a simulation exercise. We shall thus refer to the Ministry of Education projections as a basic frame for assessing the validity of our assumptions, without however using these projections themselves in the sequel.

The 1965 report of the Unesco Regional Advisory Team for Educational Planning in Asia, *Long-term projections for education in Ceylon* includes projections up to 1981. Yet it cannot replace our 1979 projections for the same reasons.

With regard to the method followed, three steps can be distinguished:

1. Assessment of the demographic expansion under alternative hypotheses of fertility rates;
2. Projection of first-level school enrolments;
3. Teacher requirements and teacher-training needs.

Each step will be described separately.

Ceylon population projection

We have used in this study the three population projections made by the Ministry of Planning and Economic Affairs, Colombo.[2] These projections are based on the same assumption of a slowly declining mortality rate, and on three sets of assumptions regarding the future behaviour of fertility: constant fertility; slow fertility decline; rapid fertility decline.

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[1] Ministry of Education, *Perspectives for the development of second-level general education 1970-80*, Colombo, Part I, 1969, (Mimeo); Part II, 1970, (Mimeo).

[2] S. Selnaratnam, N. Wright and G. Jones, *Population projections for Ceylon, 1968-98*, Colombo, Ministry of Planning and Economic Affairs, 1970.

Taking into account the age specific fertility rates and their change according to the previous assumptions and taking into account the change in the distribution by age of child-bearing women, the crude birth rate by quinquennium has been estimated as shown in table 10. Similarly, the crude death rate by quinquennium is estimated in table 11.

TABLE 10. Average crude birth rates

Years	Assumption I Rapidly declining fertility (Low assumption)	Assumption II Slowly declining fertility (Medium assumption)	Assumption III Constant fertility (High assumption)
1968-73	29.4	31.3	32.2
1973-78	25.3	30.2	33.0
1978-83	22.8	29.1	33.4
1983-88	21.4	27.5	33.1
1988-93	20.9	25.5	32.3
1993-98	20.4	23.9	31.8

SOURCE Selnaratnam, Wright and Jones, op. cit.

TABLE 11. Average crude death rates

Years	Assumption I Rapidly declining fertility (Low assumption)	Assumption II Slowly declining fertility (Medium assumption)	Assumption III Constant fertility (High assumption)
1968-73	7.0	7.0	7.1
1973-78	6.6	6.7	6.8
1978-83	6.4	6.5	6.5
1983-88	6.4	6.3	6.2
1988-93	6.7	6.4	6.3
1993-98	7.1	6.6	6.4

SOURCE Selnaratnam, Wright and Jones, op. cit.

It is to be noted that in the constant fertility assumption, the birth rates increase slightly during the first decade of the projections because of an increase in the proportion of females in the main productive ages, but by 1993-98 the birth rate is slightly below the 1968-73 level. It is also to be noted that the death rate of the low projection in 1993-98 will exceed the average rate for 1968-73 in spite of the declining mortality assumption. This is explained by the ageing of the population.

Table 12. Demographic projection (thousands)

Age	1968	Assumption I (low) 1978	1983	1988	Assumption II (medium) 1978	1983	1988	Assumption III (high) 1978	1983	1988
0-4	1 726.7	1 696.9	1 679.1	1 714.1	2 074.4	2 254.8	2 389.5	2 292.6	2 667.5	3 035.5
5-9	1 640.7	1 735.3	1 669.4	1 655.9	1 856.8	2 040.9	2 223.7	1 918.4	2 255.6	2 630.7
10-14	1 436.7	1 680.0	1 726.5	1 662.2	1 680.0	1 847.5	2 032.0	1 680.0	1 908.6	2 245.7
15-19	1 257.1	1 622.7	1 673.6	1 721.0	1 622.7	1 673.6	1 841.5	1 622.7	1 673.6	1 902.6
20-24	1 077.2	1 419.6	1 613.2	1 665.5	1 419.6	1 613.2	1 665.5	1 419.6	1 613.2	1 665.5
25 +	4 837.6	6 558.7	7 607.0	8 798.0	6 558.7	7 607.0	8 798.4	6 558.7	7 607.0	8 798.4
TOTAL	11 976.0	14 713.2	15 968.8	17 217.1	15 212.2	17 037.0	18 950.6	15 492.0	17 725.5	20 278.4

SOURCE IIEP projection.

The total population of Ceylon in 1978 would vary from 14.7 million on the low assumption to 15.4 million on the high assumption, a difference of 0.7 million. In 1988, the result is more striking, since the total population of Ceylon would be 17.7 per cent or 3.1 million higher in assumption III than in assumption I.

Let us examine more closely the age-groups which correspond, broadly speaking, to first-level education, namely 5-9 and 10-14. On the low assumption, the population of each of the 5-9 age group would increase until the end of the 1970s, and decrease thereafter until 1988, while the 10-14 age group population will keep growing up to the mid-1980s and decline thereafter. Thus the first-level enrolment would increase at a very moderate rate, and it can be anticipated that the cost of first-level schooling would not change significantly in the long run.

If one considers the medium assumption, the groups aged 5-9 and 10-14 would grow uniformly until 1988, then start to decline. The pupils belonging to the two age groups will number about 4.45 million in 1988, as against 3.3 million on the low fertility assumption. The total first-level enrolment and relevant costs can thus be expected to be significantly higher if the enrolment ratio is to remain the same.

Lastly, the high assumption emphasizes further the potential implications of the demographic factor. In 1978, there would be 3.6 million children belonging to the age groups 5-9 and 10-14; whereas in the low assumption the population of this age group is less than 3.4 million. In 1988, there will be about 4.9 million children, as compared with about 4.25 million on the medium assumption.

Let us examine the consequences of these demographic patterns on the development of the first-level school system.

First-level school enrolments

The projection of first-level school enrolments was based upon hypotheses regarding school admission rates and retention rates.

Retention rates

In order to estimate the retention rates in the first level for 1979 and 1989, we extrapolated the official projection figures of the Ministry of Education and used them as a basis to ensure consistency with the government policy of endeavouring to improve first-level schooling.

According to table 13 the retention rates are to increase over the period 1969-79; a similar pattern is assumed up to 1989. It is interesting to note that the evolution between 1969 and 1979 is rather erratic, i.e. for some grades the apparent retention rate increases, for others it decreases. The origin of these divergent trends can be found in the reduction of the pre-first-level schools from two grades to one, whereby two groups of pupils have been put together in 1966. Thus the apparent retention rate changed very considerably for each of the seven grades

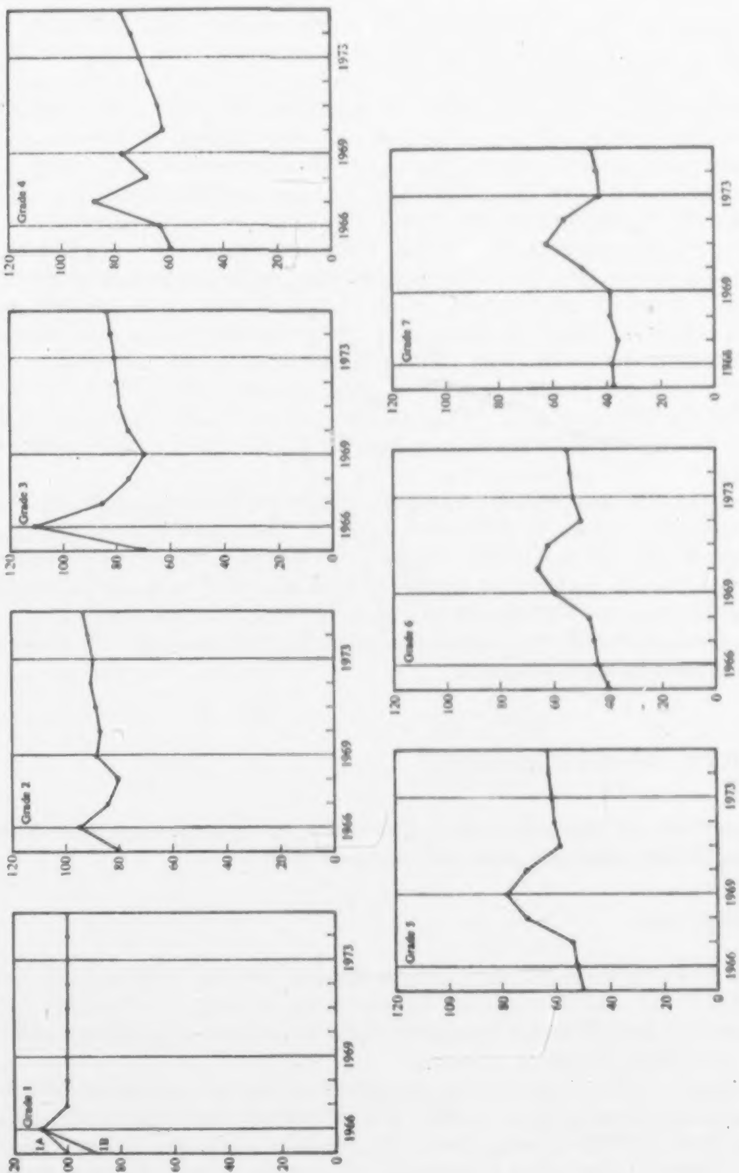

FIGURE 2. *Apparent retention rates by grades, 1965-75*

during the years 1966-75. After a preliminary increase, the apparent retention rate decreased over a period of two years, so that the effect of the 'bulge' is absorbed. Afterwards, some improvement in the retention rates is expected. This is well illustrated in figure 2.

For the period from 1979 to 1989, we have assumed a steady improvement in the rates, as shown in table 13.

TABLE 13. Retention rates, 1969-89

	1969	1979	1989
Grade 1	100.0	100.0	100.0
Grade 2	88.1	95.5	97.7
Grade 3	72.1	90.3	95.5
Grade 4	79.5	78.5	83.5
Grade 5	79.9	71.2	74.0
Grade 6	61.1	64.0	66.1
Grade 7	41.2	53.5	60.8
Grade 8	36.8	52.2	54.2

SOURCE 1969: Estimates of the Ministry of Education. See *Perspectives for the development of second-level general education, 1970-80*, op. cit. (Part II, pp. 53-54)
1979 and 1989: IIEP projection.

School admission rates and enrolments for the first-level

Following the policy of the Ministry of Education, it is considered highly desirable to eliminate the present age disparity between the pupils enrolled in grade 1; some are 5 years-old, others 6 years-old, and a large proportion of pupils are 7, 8 or even older.

In the report of the planning committee on education, health, housing and manpower (1962), the participation rates in grade 1 are assumed to be increasing for 5 and 6-year-old pupils and decreasing for older pupils, so that a less uneven age distribution of grade 1 enrolments may be expected.

We have followed these recommendations in our assumptions on admission rates. In 1969, the enrolment ratio in grade 1 for the 6-year-old group was 129.2. The Ministry of Education in its latest estimates (February 1970) assumed that, in 1979, the ratio will be 121.8. We have further assumed that the ratio will decrease to 114.4 in 1989. Such an assumption corresponds in effect to an acceleration of the concentration of grade 1 enrolments around the age of 6, which is in line with government policy and also to a reduction of repetition in grade 1. Using the admission rates (121.8 and 114.4) and the retention rates, it is possible to relate the enrolment in grade 1 to the enrolment in grades 1 to 8. Table 14 summarizes the results. It illustrates very clearly the impact of the population growth on first-level school enrolments.

On the low assumption, the school enrolment will be approximately at the same level during the next two decades. It is even slightly higher in 1979 than in 1989. This can have direct consequences on cost and quality improvement of the education system insofar as the cost is not likely to grow at a high rate, which gives the Ministry of Education the opportunity of improving teacher qualifications and the quality of the system.

On the medium assumption, the increase in enrolment is significant with approximately 450,000 pupils in each decade. On assumption III, as expected, the growth in enrolment is even higher with about 600,000 pupils for the period 1969-79 and more than 860,000 for the following decade. If one compares first-level enrolment for the three assumptions, the ratios are 1 to 1.08 and 1.13 in 1979 and 1 to 1.29 and 1.52 in 1989.

TABLE 14. Population and first-level enrolments

	Assumption I		Assumption II		Assumption III	
	1979	1989	1979	1989	1979	1989
Population aged 6	347.1	333.13	387.2	458.5	409.3	557.31
Enrolment grade 1	422.8	381.10	471.60	524.5	498.83	637.56
Admission index over 10 years	97.7	90.13	109.0	111.2	115.2	127.9
Multiplier 'B'[1]	6.10	6.53	5.90	6.13	5.81	5.90
First-level enrolment	2 579.00	2 489.00	2 782.00	3 215.00	2 896.00	3 761.00
Effect of population on enrolment	100	100	107.9	129.2	112.3	151.1

1. See page 288-9.

SOURCE IIEP projection.

Does this mean that the enrolment ratio will be higher with higher enrolment? The answer is no, since, as we have seen previously, the school-age population increases at diverse speed. In fact, the effect of population growth on first-level enrolment has no bearing whatsoever on the enrolment ratio.

Teacher requirements

The present situation

The pupil/teacher ratio statistics are not available separately for the first and second levels. One way of estimating the ratios for first- and second-level schools separately is to make reasonable assumptions regarding the qualifications of teachers at each of the two levels.

TABLE 15. Distribution of teachers by qualification in 1963 and 1969

Year	Graduates	Non-graduate				First level	Second level	Grand total	Enrolment		Pupil/teacher ratio	
		Trained	Other certifi-cates	Without certifi-cates	Total non-graduate				First level	Second level	First level	Second level
1963	4 689	27 480	24 974	23 981	76 435	63 115	18 009	81 124	2 052.5	236.5	32.5	13.2
1969	7 434	38 775	17 519	22 361	78 655	65 423	20 666	86 089	2 172.6	325.2	33.2	15.6

SOURCE IIEP estimate using data supplied by the Ministry of Education.

Table 15 shows the situation in 1963 and 1969. Graduate teachers as well as a certain proportion of the trained non-graduates teach in second-level schools; the other categories are employed in first-level schools. In 1963, the total number of teachers in that level is assumed to be 63,115 or 77.8 per cent of the total teaching force. The pupil/teacher ratio was 32.5 to 1 in the first-level and 13.2 to 1 in the second.

In 1969, according to the data available, the total number of first-level teachers amounted to 65,420 and second-level teachers numbered 20,666. On the whole, the pupil/teacher ratio stagnated in the first level, with an average of 33.2. In the second level, however, the increase in the average pupil/teacher ratio from 13.2 to 15.6 in 1969 can be interpreted in a sense as an improvement in the utilization of the teaching force.

With regard to the distribution of teachers by qualification, a comparison between 1963 and 1969 shows a significant improvement. It is notable that the proportion of graduates increased from below 6 per cent in 1963 to over 9 per cent in 1969. Similarly, the proportion of trained teachers in the first- and second-levels increased from 33.9 per cent to 45.0 per cent, owing mainly to an increase of enrolment in the teacher-training colleges over the period (from around 5,000 to about 6,000).

The assumptions

For the purpose of making the computation, we shall assume a slight improvement in the average pupil/teacher ratio during the coming two decades, namely, an average in the first-level of 30 to 1 in 1979 and 28 to 1 in 1989. These assumptions are valid for two main reasons.

Firstly, the Ministry of Education defined very clearly its aim of improving the level of qualification of the teaching force and of employing a larger proportion of teachers having received some sort of training. This would explain the trend observed during the past six years, but complete fulfilment of such policy will, in the long run, require a slight decrease in the pupil/teacher ratio.

TABLE 16. Average number of pupils per teacher in first-level education, 1967

Country	Pupils per teacher	Country	Pupils per teacher
Afghanistan (1965)	54	Iran	32
Burma	55	Japan	27
Cambodia	50	Korea	60
Ceylon [1]	33	Laos	35
India	52	Thailand	34
Indonesia	45	Viet-Nam	58

[1] IIEP estimate.

SOURCE Unesco Regional Office for Education in Asia, *Progress of Education in the Asian Region: a statistical review*, Bangkok, 1969.

Secondly, when the pupil/teacher ratio in Ceylon is compared with the ratios of other Asian countries, it can be seen that it is at the lower end of the scale. (See table 16.) It would be reasonable to assume a slight decrease in the ratio, enabling Ceylon to maintain her position at the lower end of the table with Iran, Japan and Thailand.

It should be noted that the Unesco long-term projections for education in Ceylon assumed an average pupil/teacher ratio of 29 to 1 in 1976 and 27 to 1 in 1981, on the basis of a compounded average for the first- and second-level, hence our assumption of a moderate decrease.

On these assumptions (pupil/teacher ratio equalling 30 and 28), the estimated teacher stock will be as shown in table 17 on three different demographic hypotheses for 1978, 1979, 1988 and 1989.

TABLE 17. Stock of teachers

	Assumption I	Assumption II	Assumption III
1978 [1]	86 680	91 110	93 500
1979 [1]	86 000	92 740	96 600
1988 [2]	88 620	113 360	130 780
1989 [2]	88 900	114 820	134 320

1. Pupil/teacher = 30:1
2. Pupil/teacher = 28:1

This table shows wide variations in the evolution of the teacher stock from one assumption to another. Under assumption I, a decrease will occur from the 1970s until the early 1980s, followed by an increase in the teacher stock to 88,900 in 1989. This is due to a combined effect of demographic factors and staffing conditions. Under assumptions II and III, on the other hand, a steady increase in the stock of teachers will occur until 1989. In addition, the stock of teachers is significantly different for each of the assumptions. By 1989, the ratio will probably be as high as 1.5 to 1 if one compares assumptions III and I.

Teacher requirements

The total requirement for teachers for the years 1979 and 1989 can be estimated on the basis of the replacement of teacher wastage and of the changes which will occur in the estimated stock between 1978 and 1979 for the first decade, and between 1988 and 1989 for the second decade. (See table 18.)

On the basis of the crude data available, the wastage is assumed to be 1 per cent per annum for teachers without certificates, 4 per cent per annum for untrained teachers, and above 3 per cent per annum for trained teachers. Because of the trend in the distribution of teachers by categories and the fact that the average

age of the teaching force will increase, we shall assume an average wastage rate of 4 per cent per annum.[1]

Thus the order of magnitude of the requirement[2] for replacement is given in table 18 which also includes the net requirements.

TABLE 18. Teacher requirements

	1979			1989		
	Replacement	Change	Total net	Replacement	Change	Total net
Assumption I	3 460	— 450	3 010	3 545	+ 280	3 825
Assumption II	3 645	+1 630	5 275	4 535	+1 460	5 995
Assumption III	3 740	+3 100	6 840	5 230	+3 540	8 770

It is interesting to note that, in 1979, the annual demand for teachers is likely to vary from 3,010 to approximately 6,840, or from one to two, depending upon the demographic assumption. This means that the need for teacher training will, at one extreme, require to increase very slightly the present capacity of the teacher-training system, while, at the other extreme, a particularly high annual requirement should be foreseen for the 1970s and the beginning of the 1980s. These requirements should be met, otherwise the policy of improvement in qualification for the teaching force will have to be postponed until the end of the 1980s.

Apart from the net requirements, the characteristics of the teaching force will also differ greatly. This can be seen by analysing the composition of the teacher stock by qualification for each assumption.

Teacher qualifications and staffing formulae

Two hypotheses were put forward regarding the increase in capacity of production of the teacher-training system: **A** and **B**.

TEACHER-TRAINING HYPOTHESIS A

One pattern of output of trained teachers (from non-specialist colleges) employed in first-level education is shown in table 19. In 1979 and 1989, the stock employed will amount to 34,036 and 60,060 respectively.

We assume, in the absence of any data, that the proportion of other qualified teachers will slightly decrease over the period. In 1969 they were 26.8 per cent (17,519 out of 65,423) of ' other qualified teachers '; in 1979, they will be only 20 per cent.

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[1] The Unesco long-term projection used the same average rate of 4 per cent.

[2] Assuming no change will occur in the distribution of teachers by qualification.

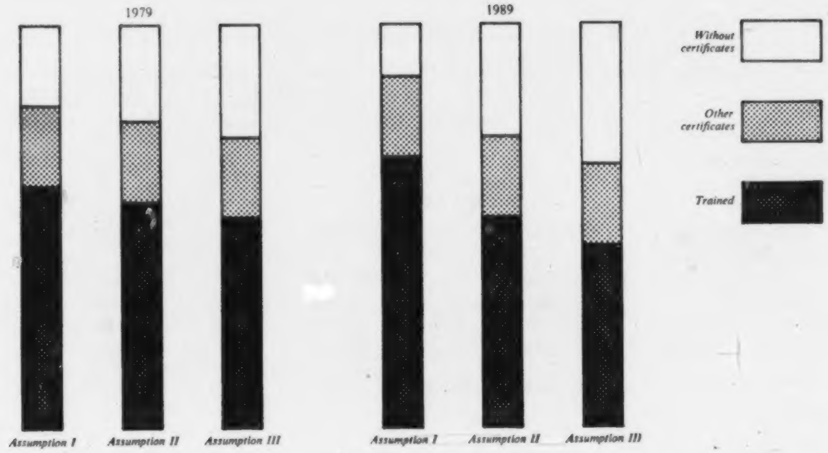

FIGURE 3. *Distribution of teachers by qualification on the assumption of a moderate rise in output*

TABLE 19. Projection formulae for trained non-specialist teachers

Year	First-level recruitment	Stock	Wastage	Available
1969	1 410	22 145	886	22 669
1970	1 440	22 669	907	23 202
1971	1 280	23 202	928	23 554
1972	1 590	23 554	942	24 202
1973	2 000	24 202	968	25 234
1974	2 500	25 234	1 009	26 725
1975	2 700	26 725	1 069	28 356
1976	2 900	28 356	1 134	30 122
1977	3 100	30 122	1 205	32 017
1978	3 300	32 017	1 281	34 036
1979	3 500	34 036	1 361	36 175
1980	3 700	36 175	1 447	38 428
1981	3 900	38 428	1 537	40 791
1982	4 100	40 791	1 632	43 259
1983	4 300	43 259	1 730	45 829
1984	4 500	45 829	1 833	48 496
1985	4 700	48 496	1 940	51 256
1986	4 900	51 256	2 050	54 106
1987	5 100	54 106	2 164	57 042
1988	5 300	57 042	2 282	60 060
1989	5 500	60 060	2 402	63 158

SOURCE IIEP projection.

TABLE 20. Distribution of teachers by qualification given the hypothesis A of rise in output and B of equi-distribution

	Assumption I		Assumption II		Assumption III	
	Amount	Percentage	Amount	Percentage	Amount	Percentage
Hypothesis A						
1979						
Trained						
Non-specialists	34 036		34 036		34 036	
Specialists and graduates	17 564		17 564		17 564	
Sub-total	51 600	60.0	51 600	55.6	51 600	53.4
Other certificates	17 200	20.0	18 550	20.0	19 320	20.0
Without certificates	17 200	20.0	22 590	24.4	25 680	26.6
TOTAL	86 000	100.0	92 740	100.0	96 600	100.0
1989						
Trained						
Non-specialists	60 060		60 060		60 060	
Specialists and graduates	—		—		—	
Sub-total	60 060	67.5	60 060	52.3	60 060	44.7
Other certificates	17 780	20.0	22 960	20.0	26 860	20.0
Without certificates	11 060	12.5	31 800	27.7	47 400	35.3
TOTAL	88 900	100.0	114 820	100.0	134 320	100.0

	Assumption I		Assumption II		Assumption III	
	Amount	Percentage	Amount	Percentage	Amount	Percentage
Hypothesis B						
1979	*As 1979 above*					
Trained						
Non-specialists			55 650		57 960	
Specialists and graduates			—		—	
Sub-total			55 650	60.0	57 960	60.0
Other certificates			18 545	20.0	19 320	20.0
Without certificates			18 545	20.0	19 320	20.0
TOTAL			92 740	100.0	96 600	100.0
1989	*As 1989 above*					
Trained						
Non-specialists			77 500		90 670	
Specialists and graduates			—		—	
Sub-total			77 500	67.5	90 670	67.5
Other certificates			22 970	20.0	26 860	20.0
Without certificates			14 350	12.5	16 790	12.5
TOTAL			114 820	100.0	134 320	100.0

SOURCE IIEP projection.

The distribution of teachers shown in table 20 is based on these assumptions; and the real impact of demographic growth on the quality of staffing appears clearly.

With hypothesis A regarding the rise in the output of the teacher-training system, the quality of the staff will improve significantly under assumption I, since the percentage of qualified teachers will reach 87.5 per cent in 1989, as against 80 per cent in 1979 and 65.8 per cent in 1969. Under assumption II, there is a smaller improvement in the distribution of qualified teachers by 1989, the total proportion will have increased from 65.8 per cent in 1969, to 75.6 per cent in 1979 and 72.3 per cent in 1989. Under assumption III, the picture deteriorates, the percentage of qualified teachers becoming lower in 1989 than in 1969 (64.7 per cent, as against 65.8 per cent), unless there is a significant increase in the output of the teacher-training system. (See figure 3.)

TEACHER-TRAINING HYPOTHESIS B

A more likely assumption is, therefore, that the pattern of projection of the teacher-training system as given in table 20 is consistent only with assumption I, i.e. that hypothesis A on teacher-training enrolments is accepted only if the demographic increase is moderate.

For assumptions II and III, there should be sharper increases in the output of teacher-training colleges to help maintain the same distribution of qualifications in teachers as in assumption I, i.e. 60 per cent, 20 per cent and 20 per cent for the three categories in 1979, and 67.5 per cent, 20.0 per cent and 12.5 per cent in 1989. This hypothesis, assuming equal distribution of teachers between the three categories under assumptions I, II and III is called the 'equi-distribution' hypothesis.

Obviously to maintain this staffing formula, the stock of trained teachers will have to be increased significantly under assumptions II and III. In 1979 it should be 57,960 under assumption III, and in 1989 it should number 90,670. This would be a substantial increase requiring a corresponding expansion of the teacher-training system.

IV The impact of demographic growth on the cost of education during the next two decades

After having examined the impact of demographic growth on first-level school enrolment and teacher training, we shall now go on to discuss the cost and provide separate estimates for first-level schooling and for teacher training.

Cost of first-level education

Recurrent cost

On account of its major share in the recurrent budget, the teacher salary cost merits separate analysis.

TEACHER SALARY COST

In order to estimate the future salary cost, it is necessary to study the probable trends of teacher categories in salary terms. (There are ten categories of teachers and four categories of headmasters.) The only way to make an accurate estimate of the incremental rise over a ten or twenty-year period would be to add the annual intake of teachers to the total existing teaching force, deduct the wastage, and calculate the salary cost for each category of teachers.

However, in spite of its obvious validity, this approach has not been used in our estimates for two reasons. Firstly, it is unlikely that the present salary structure of teachers will remain unchanged in the course of the next ten or twenty years. The work of the Salaries and Codes Commission, resulting in the 'consolidated salary system', will tend to unify the salary scaling system by introducing broader categories. This means that, in the long run, there will perhaps be only two or three categories of first-level teachers. Secondly, for practical reasons, it is impossible to estimate the present distribution of the teaching force by position on the salary scale.

For these reasons, we have used a rather crude approach for estimating the salary cost which, in spite of its lack of precision, is more appropriate for the purpose of making a sensitivity analysis. By comparing the teacher salary budget for first-level education with the distribution of teachers between the various categories, we found that, on average, these teachers are at the lower end of the scale. In the light of the changing intake into the teaching force and of the rate of wastage, it was reasonable to assume that the average salary for each category of teachers will be equal to the median position on the scale in 1979 and 1989. We have reduced the fourteen existing categories to three categories: 'trained', which includes headmasters and the assistant teachers, 'other certificates', which includes the 'teacher's certificate', 'service certificate' and the 'senior school certificate', and the remaining categories known as 'untrained'. We estimated the average salary for each of these three categories. Taking into account the distribution of teachers by category under the various assumptions, total teachers' salary cost can be estimated. Adjustments are then introduced to take into account the salary increase in real terms due to the evolution of the real gross domestic product per worker over the period. The results are shown in table 21.

TABLE 21. Teachers' salary cost, including pensions (millions of rupees)

Year	Hypothesis A			Hypothesis B	
	Assumption I	Assumption II	Assumption III	Assumption II	Assumption III
Unadjusted					
1979	289.4	307.4	317.6	312.1	325.1
1989	307.0	376.0	428.0	396.4	463.7
Adjusted (high)					
1979	353.9	375.9	388.5	381.7	397.5
1989	488.1	591.3	669.1	623.4	725.1
Adjusted (low)					
1979	321.8	341.8	353.2	347.0	361.5
1989	403.1	488.4	552.6	514.8	598.8

SOURCE IIEP projection

The results are most significant: without taking into account salary adjustments reflecting the evolution of productivity, it is clear that the teachers' salary cost is likely to vary considerably depending upon the demographic assumption chosen. In 1979, the budget should be 10 per cent higher under assumption III than under assumption I. For 1989, the difference is obviously larger: i.e. 39 per cent more money will be needed. Although, as has been said above, the average qualification of the teaching force will be lower under assumption III than under assumption I.

If, however, the government intends to maintain the present pattern of improving the qualification of the teaching force, the budgetary impact of alternative hypotheses becomes even greater, with a rise of about 13 per cent in 1979 and more than 50 per cent in 1989.

Other recurrent cost

According to the IIEP estimates, in 1969, other recurrent costs for first-level education amounted to about Rs.25 million, of which 38.5 per cent were administration costs and 40.5 per cent pupil welfare costs, and the rest for miscellaneous costs including debt services, facilities and maintenance.

The average unit cost per pupil was about Rs.10. We have assumed that other recurrent costs for administrative services, equipment and maintenance will average in real terms Rs.20 in 1979 and in 1989. This is consistent with the estimates made by the Ministry of Education in *Perspectives for the development of second-level general education* in February 1969, and with the more recent projections of February 1970.[1] Taking into account in addition canteen services cost, the other recurrent costs can be estimated as shown in table 22.

TABLE 22. Other recurrent costs (thousands of rupees)

	Assumption I	Assumption II	Assumption III
1979	103 160	111 280	115 840
1989	99 560	128 600	150 440

Capital cost of first-level education

The cost of the increase in enrolment should be computed separately from the cost of replacement of buildings. Table 23 gives the requirements in terms of number of pupil places. It is interesting to note that, under assumption III, the net requirements will be over twice that under assumption II.

TABLE 23. Increase in enrolment

	Assumption I	Assumption II	Assumption III
1978/79	—15 000	+49 000	+91 000
1988/89	+ 8 000	+41 000	+99 000

NET REQUIREMENT FOR REPLACEMENT OF BUILDINGS

In theory, one should examine the existing school facilities by age and type, in order to assess the replacement need; unfortunately no data is available for this purpose. Therefore, the life duration of the school building has been estimated arbitrarily at an average of thirty years. Thus the stock of pupil places required in 1979 and 1989 is considered to be equal to the increase in enrolment in 1949 and 1959. Referring back to the enrolment statistics, the figure is 58,180 for 1979 and 111,700 for 1989.

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[1] Op. cit., see page 92.

ESTIMATING CAPITAL COST

Using the capital cost figures given in Part II,[1] the average capital cost per place is estimated at Rs.280. Thus the total capital cost is calculated as shown in table 24.

It should be noted that the demographic growth assumption has little effect on the capital cost for the horizon years 1979 and 1989, as the capital replacement cost depends to some extent on the *past* evolution of the total amount of school facilities. The other main factor which determines the level of capital cost in 1979 and 1989 is basically the net expected increase or decrease in enrolment between 1978 and 1979 on the one hand and 1988 to 1989 on the other.

TABLE 24. Capital cost of first-level schools (thousands of pupil places, millions of rupees)

	Assumption I		Assumption II		Assumption III		
Year	Pupil places	Amount	Pupil places	Amount	Pupil places	Amount	Replacement
1979	43 180	12.1	107 180	30.0	149 180	41.7	16.3
1989	119 700	33.5	152 700	42.8	210 700	59.0	31.3

SOURCE IIEP projection.

Cost of teacher training

Unit cost of teacher-training colleges: past and future trends

Appendix, table 3 shows the evolution of recurrent costs of non-specialist teacher-training colleges during the period 1965-70. Using the college enrolment, one can estimate the unit cost by type of expenditure as in table 25.

TABLE 25. Unit costs of teacher-training colleges (in rupees)

	1965	1967	1968	1969
Salary unit cost	406	447	607	618
Stipend	1 920	1 920	1 920	1 920
Other costs	81	102	205	427
Total recurrent (unit costs)	2 407	2 469	2 752	2 965

---

[1] See page 90-91.

The estimates of future unit costs, i.e. in 1979 and 1989, are made separately for each item. Salaries will vary according to GDP per person of working age. The stipend is assumed to remain constant. Other recurrent unit costs are assumed to average 15 per cent of the total recurrent cost. Table 26 gives the projection.

TABLE 26. Total recurrent unit cost of teacher-training colleges (in rupees)

	1979	1989		
		Assumption I	Assumption II	Assumption III
Hypothesis A	3 148	3 415	3 402	3 395
Hypothesis B	3 067	3 211	3 203	3 197

Recurrent cost of non-specialist teacher-training colleges

In order to obtain the total recurrent cost of non-specialist teacher-training colleges, we need to estimate their enrolment in 1979 and 1989. We have assumed that no wastage will occur and that the enrolment of 1979 and 1989 will be equal to the number graduating in the three following years, namely, 11,700 in 1979 and 17,700 in 1989, in the case of moderate expansion of teacher-training output. In the equi-distribution case, the enrolment should be 12,640 in 1979 and 22,830 in 1989 under assumption II and 13,140 in 1979 and 26,730 in 1989 under assumption III. Thus, the total recurrent cost of teacher training will vary from Rs.35.8 million on hypothesis A in 1979 to Rs.60.4 million on hypothesis B in 1989 (assumption I). In the equi-distribution hypothesis, the total current cost would vary from Rs.35.8 million to Rs.41.3 million in 1979, and from Rs.56.8 million to Rs.90.7 million in 1989.

Conclusion

Comparing recurrent costs and GDP

One way of assessing the effort necessary to reach the 1979 and 1989 targets is to express it as a proportion of GDP.

In 1968, the total gross domestic product at current market prices was estimated at Rs.11,770 million, and the share of first-level education and teacher-training expenditures represented 1.89 per cent.[1] In order to follow the increase of this share in the future, it is necessary to estimate the growth rate of total GDP, the growth rate of GDP per head of the working-age population, and to assess the possible effect of the latter on the level of teachers' salaries and other costs.

Two assumptions are made: a high assumption with a growth rate of GDP equal to 5 per cent per annum; a low assumption with a growth rate of 4 per cent. (The rate chosen in the 1966-67 projection of the Ministry of Planning was 4.5 per cent.) In both cases, the rate of growth of teachers' salaries is assumed to be equal to the rate of growth of GDP per head of the working-age population. The share of GDP devoted to first-level education and teacher training can be estimated as shown in table 27.

A comparison between 1969 and the horizon years might at first sight appear surprising. The percentage of GDP devoted to first-level education and teacher training will increase until 1979, and decrease thereafter until 1989, except for assumption III. This is partly due to the trend of enrolments. However, when analysing the assumptions in more detail, one finds that their effect on cost expressed as a percentage of GDP is somewhat compensatory. For example, the higher the growth rate of population the lower the rate of increase of salaries in real terms[2] which will be reflected by a correspondingly lower cost in terms of the percentage of GDP. In addition, as enrolment in the first level does not increase under assumption I, and the unit cost is expanding at a lower rate than

---

[1] Rs.223.3 million, excluding capital expenditure.

[2] Because of an assumption that teacher salaries will increase at the same rate as the GDP per person of working age.

GDP per worker, it is not surprising to find a decrease in the percentage of GDP going to first-level education and teacher training from 1979 to 1989.

Another striking point arises when one compares the various percentages under assumption II. They are all equivalent, ranging from 2.49 to 2.80. Again, this can be explained by the fact that, while the school population will increase steadily over the period, the alternative hypotheses concerning the staffing formulae and the rate of growth of GDP per worker lead to compensatory effects.

The most interesting comparisons observed here are those between the three demographic assumptions for each horizon year.

High economic growth assumption

Either no measures will be taken to maintain a reasonable pattern of distribution of teachers by qualification (hypothesis A), in which case the percentage of GDP required for first-level education will vary from 2.57 per cent to 2.82 per cent in 1979, and from 2.07 per cent to 2.81 per cent in 1989. Alternatively, minimum efforts will be made to maintain such a pattern of distribution, in which case the proportion of GDP devoted to education should be increased up to about 2.89 per cent in 1979 and even 3.09 per cent in 1989. When compared with the figures under assumption I (2.57 in 1979 and 2.07 in 1989), it is clear that demographic expansion will increase the share of GDP for first-level schools and teacher training by as much as 50 per cent in 1989.

Low economic growth assumption

The results here are similar to the preceding ones. Depending upon the growth of GDP, the school budget can vary in the ratio of 1 to 1.11 in 1979, and 1 to 1.49 in 1989. Or, to put it differently, the difference between the minimum cost assumption and the maximum cost assumption is Rs.57 million in 1979 and as much as Rs.216 million in 1989. This last figure is higher than the total actual budget of first-level education and teacher training in 1969. In terms of percentage of GDP, the difference is over 1 per cent! In short, if the population of Ceylon continues to evolve according to assumption III until 1989, the enrolment will be as high as 3,761,000 pupils (or 1,272,000 more than under assumption I), and will cost Rs.835 million (or 276 million more than under assumption I), which represents 3.23 per cent of GDP (or 1.07 per cent of GDP more than under assumption I).

On the whole, it can be said that the higher the rate of growth of GDP the easier it is to finance the expansion of the education system; this appears clearly from table 27. With a 4 per cent rate of growth, nearly 3 per cent of GDP will be required to finance first-level education in 1989 under the extreme demographic assumption.

TABLE 27. Proportion of GDP devoted to first-level education and teacher training (millions of rupees)

Year	Total GDP	Growth of teachers' salaries [1] (percentage)	Hypothesis A						Hypothesis B			
			Assumption I		Assumption II		Assumption III		Assumption II		Assumption III	
			Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage
5 per cent growth												
1979	19 173	2.1	494	2.57	524	2.73	541	2.82	532	2.77	555	2.89
1989	31 226	2.3	648	2.07	780	2.49	880	2.81	830	2.65	966	3.09
4 per cent growth												
1979	17 420	1.1	461	2.64	489	2.80	505	2.89	497	2.85	518	2.97
1989	25 788	1.3	559	2.16	674	2.61	760	2.94	716	2.77	835	3.23

[1] This figure is the rate of growth of GDP per member of the working age population.

SOURCE IIEP projection.

Appendix

TABLE 1. Non-university graduate teachers teaching in elementary classes (i.e. grades 1-7; age group 5-11 years) in all schools[1] with their salary scales as at 31 December 1969

Category	Salary scale (rupees)[2]	Number
0. Headmasters/headmistresses	Several (Min: 3 180 Max: 6 024)	5 426
1. Assistant teachers:		
(a) General trained: 1st class	1 272 – 3 000 (3 360 – 5 592)	21 200[1]
(b) General trained: 2nd class	1 056 – 1 200 (3 090 – 3 450)	
2. (a) Teachers' certificate: 1st class	1 050 – 1 512 (3 060 – 3 720)	
(b) Teachers' certificate: 2nd class	864 – 1 008 (2 820 – 3 060)	13 640
(c) Teachers' certificate: 3rd class	768 – 823 (2 640 – 2 748)	
3. Service certificate	768 – 1 410 (2 640 – 3 450)	156
4. Uncertificated	768 – Fixed (2 424 – 3 126)	15 722
5. Senior school certificate (English)	804 – 876 (2 694 – 2 856)	733
6. Senior school certificate (Science)	864 – 928 (2 890 – 3 060)	189
7. Pupil teachers	1 800 – Fixed (1 800)	6 324
TOTAL		63 390
Total net in grade 1-7		61 200[1]
Total of first-level teachers		65 423

[1] There are 1,494 'elementary' schools where second-level classes are temporarily allowed to continue, and the teachers for grades 8, 9 and 10 in these schools are also included in this statement. We assume that 2,190 teachers are teaching in these grades; thus the net total in grades 1-7 is 61,200.

[2] In each category, the first figure is the basic salary scale; the figure in brackets, immediately below, is the consolidated salary. Previously some allowances were added to the basic salary. However, with effect from 1 October 1969, consolidated scales were established.

SOURCE Departmental records, Ministry of Education.

TABLE 2. Unit cost calculation for the first level assuming that unit cost for the second level = A x unit cost first level
(A varies from 2:4 in 1963 to 3:2 in 1969)

Year	First-level enrolment (thousands)	Second-level enrolment x A (thousands)	First level + second level x A (thousands)	Total expenditure [1] (thousands of rupees)	First-level unit cost (rupees)	First-level expenditure (thousands of rupees)	Second-level expenditure (thousands of rupees)
1963	2 052.5	768.5	2 820.0	300 000 [2]	106.1	217.8	72.2
1966	2 056.6	1 123.2	3 180.0	319 119	102.5	210.8	94.2
1968	2 142.9	1 137.1	3 280.0	340 482	103.1	220.9	104.1
1969	2 172.6	1 172.4	3 345.0	344 409	102.8	223.3	104.2

1. Includes teacher education.
2. Estimate.

SOURCE Enrolment figures given in table 36 of *Perspectives for the development of second-level general education 1970-80*, op. cit.

TABLE 3. Current cost of the teacher-training systems (thousands of rupees)

Non-specialist training colleges	1965	1967	1968	1969	1970 [1]
Salaries [2]	1 601.9	1 804.8	2 507.5	2 597.5	2 700.9
Student stipends [3]	7 576.3	7 751.0	7 929.6	8 064.0	8 661.1
Other costs [4]	319.5	413.8	848.6	1 075.2	1 926.4
TOTAL	9 497.7	9 969.6	11 285.7	11 736.7	13 288.4

1. Estimate derived from Ceylon government estimates 1969-70, Head 145, Vote 4, Sub-heads 27 and 55 to 61.
2. Salaries include those of teaching and non-teaching staff only.
3. Student stipends include payments made to teacher-trainees.
4. Other costs include expenditures incurred for maintenance of and improvements to training colleges. They also cover general expenditure, curriculum development, payments to experts, library books, etc.

SOURCE *Financing and costs of first-level general education programme, including teacher education, 1964-65, 1967-68 and 1968-69*, Secondary Education Division, Ministry of Education, Colombo.

Colombia: a case study

Ta Ngoc Châu and Françoise Caillods

Contents

General information on Colombia 121

Introduction 123

I. Financing educational expenditure 125
Breakdown of expenditure by source of finance 125
Breakdown of public expenditure by level of education 130

II. The development of first-level education in recent years 132
Growth of enrolment 132
Wastage in the first-level system 133
The structure of the teaching force 137
The cost and financing of first-level education 140

III. The effect of population growth on educational expenditure . . . 143
Population growth 143
Projection of enrolments 148
Projection of the supply of and the demand for teachers 155
Projection of expenditure 160

Conclusion 160

Appendix 171

EXPLANATORY NOTE

This report has been prepared from materials supplied by the Ministry of Education and from the findings of a research mission in Bogota carried out during April 1970. The Institute is very grateful to the Ministry of Education, the Bureau of Educational Planning and the Colombian Delegation to Unesco, for their total co-operation and assistance. Although, traditionally, the work of civil servants should not be acknowledged in public, the names of Mr. Eduardo Ortiz and Mr. Raul Vivas Dorado, at least, must not pass unmentioned.

General information on Colombia

GEOGRAPHICAL LOCATION AND CLIMATE

Colombia, with an area of 455,335 square miles, is situated at the northern point of the continent of South America, bounded on the west by the Pacific Ocean and on the east by the Caribbean Sea. The three chains of the Cordilleras of the Andes running from north to south, divide the country into three very different zones—in the north and west the humid and tropical coast, in the centre the fertile and temperate plains between the mountain chains, and in the south-east the Amazonian jungle.

POPULATION

The 1964 census recorded a population of 17,482,000. The 1968 population was estimated at 20,686,000. The population growth rate is 3.4 per cent per annum. This extremely fast growth is mainly due to a fall in the death rate. The population is extremely young: in 1964, 46 per cent of the population were under 15. There is very substantial migration from the countryside to the towns; in 1951 the rural population was 61.1 per cent of the total, but in 1964 it had fallen to 47.2 per cent only. The greater part of the population is concentrated in the part of the country which lies between the three Cordilleras of the Andes. The capital, Bogota, has a population of 1,700,000 and there are three other cities with a population of more than 500,000.

Most of the population are of European or mixed origins, but there are some Negro communities on the west coast and some Indian communities in the Amazon region.

PRINCIPAL RESOURCES

Colombia is mainly an agricultural country. Coffee accounts for about 60 per cent of total exports. Other crops, such as corn, yucca, rice and potatoes are grown mainly for local consumption.

Colombia is the fourth oil producer in Latin America. The other mineral resources are of minor importance; coal, of mediocre quality, gold, silver, copper, platinum, uranium.

GROSS DOMESTIC PRODUCT

Between 1962 and 1967 the gross domestic product (GDP) in real terms (constant 1958 pesos) grew at an average annual rate of 4.4 per cent. Agriculture accounts for 29.7 per cent of the GDP, and manufacturing industry, in spite of its relatively rapid growth, for only 18.8 per cent (table 1). (US $ 1 = 17.50 pesos, October 1969.)

TABLE 1. Gross domestic product (millions of 1958 pesos)

	1962	Percentage	1967	Percentage
Agriculture	8 219.0	32.1	9 491.9	29.7
Mining	827.5	3.2	1 054.3	3.3
Manufacturing industry	4 676.6	18.3	6 000.3	18.8
Construction	845.1	3.3	1 118.3	3.5
Electricity, gas	239.0	0.9	352.0	1.1
Commerce	3 939.7	15.4	4 990.1	15.6
Transport	1 547.6	6.0	1 908.2	6.0
Communications	162.2	0.6	272.9	0.9
Government	1 227.4	4.8	1 550.3	4.8
Others	3 931.2	15.4	5 208.7	16.3
TOTAL	25 615.3	100.0	31 947.0	100.0

EDUCATION SYSTEM

First-level education, lasting five years, is free in the state schools and, in principle, compulsory. More than 80 per cent of first-level school enrolments are in the state schools.

Second-level education generally lasts six years; there are five streams, namely, general, teacher-training, industrial, commercial and agricultural, but the majority of pupils follow the general stream. It is at this level that private education is most highly developed, accounting for more than half the enrolments.

Third-level education is co-ordinated by the Colombian institute for the development of higher education (ICFES). There are national, provincial and private universities (with 46.7 per cent of enrolments in 1966).

Introduction

Over the last fifteen years, the education systems in most developing countries have evolved very fast. The evolution has mainly taken the form of increased enrolments at the different levels of education, without always being accompanied by an improvement in quality. One major cause of increased enrolments is the increase in the school-age population. Its effect, however, is not always clearly recognized since it is combined with other factors such as higher intake ratios or improved retention rates.

In order to assess the true effects of population growth, four case studies have been conducted in Ceylon, Colombia, Tanzania and Tunisia. These case studies are not designed to forecast the future development of education in these countries, and still less the future level of educational expenditure. They are merely designed to indicate the proportion of the increase in educational expenditure which may be attributed to population growth, given *various assumptions about the development of education.*

It is also important to note that these studies are based on the existing organization of education and the methods currently applied. Although, in certain cases, a reform of that organization and changes in methods are desirable, and although these questions are particularly important in the present context of educational development, they cannot be dealt with in the framework of these studies.

Finally, for various reasons, these studies are limited to first-level education and teacher-training. In the case of Colombia, which is the subject of the present study, it is a very delicate matter to forecast the possible future rate of transition from first- to second-level education. At the present time, the wastage in first-level education is very substantial. In the urban public schools, for example, out of 1,000 pupils entering the first-level cycle, only 507 will reach the fifth class. In the rural zones the situation is even worse. The figure for those who will reach the fifth class is only 40! As a result of this high wastage at first level, although the rate of transition from first level to second level is relatively high, the proportion of children of a given age group who can be admitted to second-level education is low.

The problem of drop-out is causing great concern to the Colombian authorities, and considerable efforts are being made to reduce it. If their policy were to succeed, the proportion of children in an age group who would complete their first-level studies would greatly increase. The problem of access to second-level education would then arise and it may be relevant to consider whether the rate of transition from first- to second-level education could be maintained at its present level. It is all the more hazardous to forecast the trend of this transition rate, since second-level education, unlike the first-level, is not free.

Furthermore, more than half the enrolments in second-level schools are in private schools (table 2). Unfortunately, the available data on the cost of private education are fragmentary and incomplete, and it is scarcely possible to make anything like a precise estimate of the average cost of private education.

TABLE 2. Comparative enrolments in public and private general second-level education (*bachillerato*)

	Public		Private	
	Numbers	Percentage	Numbers	Percentage
1960	50 727	36.1	89 602	63.9
1961	55 635	35.6	100 644	64.4
1962	63 177	36.1	111 789	63.9
1963	75 683	37.5	126 297	62.5
1964	89 703	39.2	138 943	60.8
1965	111 138	41.8	155 002	58.2
1966	130 895	40.1	189 392	59.9

SOURCE DANE, 'La educación en Columbia' in *Boletín mensual de estadística*, Bogota, Departamento Administrativo Nacional de Estadistica, 1969.

In addition to these reasons, which are rather particular to Colombia, another much more general one must be mentioned. Since the average age of admission to second-level education is 12, and it normally lasts six years. any change in fertility during the 1970's will not begin to influence numbers in the first grade of second-level education until 1982 onwards, and will not affect all second-level grades until the end of the 1980's and the beginning of the 1990's. In estimating the effects of changes in fertility on the numbers and cost of second-level education, therefore, projections must be made more than twenty years ahead. Over such a long period any assumption as to the trend of costs would be particularly hazardous, especially since the structure and content of second-level education might change completely in the meantime.

But before studying the effect of various population growth assumptions on enrolments and cost in first-level education, on demand for teachers and development and cost of teacher training, we must analyse the state of education in Colombia in recent years, to show the level of expenditure and how it has been financed, and, finally, to go more deeply into the development and cost of first-level education.

I Financing educational expenditure

Although private education plays an important role in Colombia, at the first and second levels as well as at the third level, the data on the cost of private education are very fragmentary and imprecise. In the following remarks we shall therefore limit ourselves to public expenditure on education.

We shall start by analysing expenditure according to source of finance, and then go on to break it down by level of education.

Breakdown of expenditure by source of finance

The system of financing educational expenditure in Colombia is relatively complex, and the sources of finance are numerous. The four main sources of public finance are the state, the provinces, the municipalities and the decentralized establishments (table 3). But other institutions also share in financing; for example, the Coffee Planters' Association and the Provincial Distilleries contribute to some extent to the financing of educational expenditures.

There are also transfers and grants from one source of finance to another. In order to avoid double-counting, an attempt must be made to estimate the real contribution of each of these sources, i.e., its expenditure net of transfers received. In part, because of recent changes in the system of educational financing —in particular the creation of decentralized establishments—and in part, because of the lack of precise information about these transfers, we have only been able to reconstitute the expenditure of all sources of finance for a relatively short period.

It has been impossible to obtain information about the net expenditure of decentralized establishments for the years 1962 and 1963. Full data for all sources of finance therefore exist only for the period 1964-67. Over this period, the state share has been predominant, although tending to fall gradually from 53.4 per cent of recurrent expenditure in 1964 to 48.5 per cent in 1967. The share of the provinces, on the other hand, has progressively increased. This increase in the role of the provinces in financing educational expenditure encounters difficulties mainly because their resources do not increase as fast as their

TABLE 3. Public educational expenditure by source of finance

	1962	1963	1964		1965		1966		1967	
	Amount	Amount	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage
Recurrent expenditure (current pesos)										
State	374 390	473 387	597 919	53.4	667 832	52.1	841 580	49.8	886 980	48.6
Provinces	267 085	312 148	348 358	31.0	432 030	33.7	571 494	33.9	649 398	35.5
Municipalities	61 391	73 464	86 902	7.7	80 698	6.3	118 684	7.0	134 142	7.3
Decentralized establishments	—	—	89 037	7.9	101 338	7.9	156 922	9.3	157 736	8.6
TOTAL	—	—	1 122 216	100.0	1 281 898	100.0	1 688 680	100.0	1 828 256	100.0
Capital expenditure (current pesos)										
State	90 993	73 792	103 843	72.8	76 315	40.3	83 780	32.3	128 000	44.8
Provinces	11 104	14 494	9 624	6.7	17 007	9.0	10 541	4.1	20 468	7.2
Decentralized establishments	—	—	29 183	20.5	95 875	50.7	164 679	63.6	137 170	48.0
TOTAL	—	—	142 650	100.0	189 197	100.0	259 000	100.0	285 638	100.0
Total expenditure (current pesos)	—	—	1 264 866		1 471 095		1 947 770		2 113 894	
Total expenditure (1966 pesos)	—	—	1 637 242		1 780 516		1 947 770		1 907 770	

SOURCE Net contributions calculated from processing the appropriation accounts of the state, provinces, municipalities and decentralized establishments.

TABLE 4. Educational expenditure and total expenditure of the different levels of government

	1962	1963	1964	1965	1966	1967	1968	1969
State								
Educational expenditure	465 383	547 629	701 762	744 147	925 360	1 014 980	1 379 279	1 438 597
Total expenditure	3 386 011	4 175 831	4 705 992	5 807 800	7 719 627	8 132 131	11 011 288	11 361 967
Percentage	13.74	13.11	14.91	12.81	11.98	12.48	12.52	12.66
Provinces								
Educational expenditure	393 169	526 086	628 329	721 723	904 801	1 011 271		
Total expenditure	1 073 463	1 330 913	1 624 771	1 788 276	2 055 032	2 286 699		
Percentage	36.62	39.52	38.67	40.35	44.02	44.22		
Municipalities								
Educational expenditure	70 269	78 896	90 934	101 064	143 791	160 624		
Total expenditure	1 379 376	1 723 873	1 968 288	2 186 624	2 534 932	3 284 614		
Percentage	5.09	4.57	4.61	4.62	5.67	4.89		
Decentralized establishments								
Educational expenditure			224 369	337 558	452 784	539 469	715 457	867 821
Total expenditure			3 969 765	4 399 020	6 042 305	8 816 990	2 810 489	14 230 733
Percentage			5.65	7.67	7.49	6.11	5.58	6.09

SOURCE *Boletín de la Dirección General del Presupuesto*, Part II, Bogota, 1969.

expenditure.[1] The state share may therefore be expected to increase in the future.

The decentralized establishments have developed rapidly in recent years. Most of them are concerned with third-level education, but one important establishment, the SENA (Servicio nacional del aprentizage) deals with vocational education. The share of the decentralized establishments has increased noticeably, in particular, in capital expenditure.

It should finally be noted that, while educational expenditure from all sources has increased steadily in constant pesos, this increase is less marked if account is taken of the rise in prices. In fact growth stabilized between 1966 and 1967. In real terms it has been about 5 per cent per annum.

Another way of assessing the educational development effort made by the various levels of government is to compare their educational expenditure with their total expenditure. In order not to distort the comparisons, we have taken the expenditure commitments of each level, and not the net contribution. Transfers and grants exist for educational expenditure as much as for other items of expenditure. The figures in table 4 are not therefore of the same nature as those in table 3.

Compared with expenditure in other countries, the proportion of educational expenditure within the total state expenditure seems relatively modest; it averages 13 per cent. It is at provincial level that this proportion is highest, and is, moreover, tending to increase gradually. It seems unlikely that this tendency can persist in future without an increase in transfers from the state for the benefit of education in the provinces.

The proportion of educational expenditure in the municipalities and decentralized establishments is relatively low. Attention should, however, be called to the fast development of the whole sector of decentralized establishments, whose total expenditure is even greater than that of the state.[2]

Finally, it is interesting to compare total public educational expenditure with the gross domestic product (table 5).

TABLE 5. Public educational expenditure and gross domestic product (millions of current pesos)

	1964	1965	1966	1967
Total educational expenditure	1 264.8	1 471.1	1 947.8	2 113.9
Gross domestic product	53 760	60 797	73 612	83 525
Percentage	2.35	2.41	2.65	2.53

SOURCE Educational expenditure: see table 3.
Gross domestic product: Banco de la Republica, *Cuentas Nacionales 1950-67*, Bogota, 1969 (p. 28).

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[1] The provinces contribute to the construction and equipment of educational buildings, payment of the expenditures of any first-, second- or third-level establishments for which they are responsible and partially to the payment of first-level teachers' salaries.

[2] It should be remembered that the reference is to the total expenditure of decentralized establishments and not their net contribution.

TABLE 6. Breakdown of public recurrent expenditure by level of education

	First-level education		Second-level education		Teacher training		Third-level education		Others		
	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage	Total
1964	465 994	45.0	163 769	15.8	55 182	5.3	206 162	19.9	144 207	14.0	1 035 314
1965	534 468	44.5	196 242	16.3	59 591	5.0	209 510	17.4	201 389	16.8	1 201 200
1966	683 620	43.5	258 720	16.5	78 299	5.0	267 881	17.1	280 476	17.9	1 569 996
1967	728 962	43.0	305 823	18.1	92 756	5.5	334 167	19.7	232 406	13.7	1 694 114

SOURCE Expenditure calculated from the appropriation accounts of the state, provinces and decentralized establishments.

Once again, compared with percentages in other countries, this percentage is low, at around 2.5 per cent. It relates, however, to public education only, and would certainly be higher if the cost of private education, which is very substantial at the second and third level, were included.

Breakdown of public expenditure by level of education

We shall analyse, in turn, recurrent expenditure and capital expenditure.

Recurrent expenditure

The breakdown of expenditure by level and type of education is known only for the state, provinces and decentralized establishments. For the municipalities only aggregate educational expenditure is available, but, as we have seen, municipal educational expenditure is a relatively small part of the total (about 7 per cent).

The breakdown of recurrent expenditure by level of education is shown in table 6 (with municipal expenditure excluded).

The period under study is not long enough to reveal trends, and what is more, we have to be aware of the fact that the lack of data on private expenditure distorts the structure of expenditure by level of education. Two important facts, however, are worth noting for public expenditure. The first is the large share of first-level education and teacher training, which together account for nearly 50 per cent of the total recurrent expenditure. The second is the relatively modest share of second-level education, precisely because of the importance of private education at this level.

TABLE 7. Public capital expenditure by type of education (millions of pesos)

	1964	1965	1966	1967
State and decentralized establishments				
First level	51 421	43 651	39 089	40 514
Second level	20 380	23 234	18 478	56 357
Third level [1]	12 073	79 857	125 860	91 996
Others	49 152	25 448	65 032	76 303
Sub-total	133 026	172 190	248 459	265 170
Provinces	9 624	17 007	10 541	20 468
GRAND TOTAL	142 650	189 197	259 000	285 638

1. Not including the 'capital' expenditure of ICETEX, which mainly consists of repayable loans to students for study in Colombia or abroad.

SOURCE Expenditure calculated from the appropriation accounts of the state, provinces and decentralized establishments.

Capital expenditure

The breakdown of capital expenditure by level of education exists only for the state and decentralized establishments and not for the provinces (table 7).

Contrary to what we have found for recurrent expenditure, capital expenditure in first-level education is relatively low.[1] Third-level education expenditure, on the other hand, is high. It fluctuates widely from year to year as a result of the overlap of the development programmes of the different universities, so that the level of expenditure in any given year has little significance. A substantial part of this expenditure is, moreover, financed by international loans. A large increase in capital expenditure in second-level education can be noted between 1966 and 1967. This tendency will, in all likelihood continue in future with the gradual implementation of the reform of second-level education. It is proposed that all new school buildings shall be of the INEM type (Institutos nacionales de educación media), which are generally larger than the existing second-level schools and will group together the general, technical, commercial and industrial streams (comprehensive school).

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[1] First-level school building is not exclusively carried out by the state. A certain number of other institutions take part in it, particularly the Provincial Distilleries and the Coffee Planters' Federation.

II The development of first-level education in recent years

First-level education is in principle compulsory for all children between the ages of 7 and 11. The situation, however, differs widely from the rural areas to the urban areas. To give an idea of the development of this education, we shall analyse, in turn, the growth of enrolment, the wastage found in the system, the teacher qualification profile, and finally, costs and financing.

Growth of enrolment

Total first-level enrolments went up from 2,096,406 in 1963 to 2,733,432 in 1968, an average annual growth rate of 5.45 per cent (table 8). This growth is due partly to an increase in new entries, but mainly to a certain improvement in the retention rate which has brought about a progressive growth in all classes, and especially in the top classes.

TABLE 8. Enrolments in public and private first-level education, 1963-68

Year	Grade I	Grade II	Grade III	Grade IV	Grade V	Total
1963	910 097	539 030	298 145	201 271	147 863	2 096 406
1964	936 972	561 748	327 012	221 251	166 440	2 213 423
1965	922 056	574 162	349 324	244 309	184 163	2 274 014
1966	949 341	592 152	379 930	272 547	208 060	2 402 030
1967	1 005 932	625 814	414 541	295 203	229 466	2 570 956
1968	1 056 078	659 468	449 150	317 862	250 874	2 733 432

SOURCE 1963-66: DANE, 'La educación en Columbia', op. cit. (pp. 112-119)
1967: Ministerio de educación nacional, unpublished documents
1968: DANE, *Censo de establecimientos educativos 1968*, Bogota, Ministerio de educación nacional, 1968. (p. 54).

The growth of enrolment nevertheless differs from the urban to the rural areas. Table 9 shows the enrolment ratio by age in these two areas in 1968.

TABLE 9. Enrolment ratios by age in 1968 in public and private first-level schools in urban and rural areas

Age	Urban areas			Rural areas		
	Population	Enrolments	Enrolment ratio in percentage	Population	Enrolments	Enrolment ratio in percentage
7	364 300	257 837	70.8	284 000	165 729	58.4
8	351 300	255 660	72.8	273 800	163 141	59.6
9	338 300	249 282	73.7	263 600	153 565	58.3
10	325 400	254 340	78.2	253 600	154 233	60.8
11	312 500	223 227	71.4	243 500	119 072	48.9
12	300 000	200 611	66.9	233 100	107 021	45.9
13	287 000	135 121	47.1	223 700	67 218	30.0
14	274 400	158 585	57.8	213 800	68 510	32.0

SOURCE Population calculated from data supplied by *Boletín demográphico*, Santiago, Celade, 1969 (Año 2, Vol. III)
Enrolments: *Censo de establecimientos educativos*, op. cit., (p. 138 and following).

The enrolment ratios in the urban areas are definitely higher than those in the rural areas and the gap tends to widen after the age of 10. These ratios, however, do not give a true picture of first-level education, partly because of late entries, and partly because of the magnitude of drop-out.

Table 10 gives the breakdown by age of new entries into public and private first-level education in the urban and rural areas.

Late entry seems more marked in public schools than in private ones, and in rural more than in urban areas. The range of age of new admissions shown in table 10 gives an idea of the size of this late entry. It is to be noted that total admission as a percentage of the 7-year-old population has already reached 118 per cent in urban areas and 134 per cent in rural areas. These percentages show that the pattern and rhythm of admissions is changing rapidly and that all children end up by entering first-level school with varying degrees of delay. The problem for Colombia, therefore, is not to increase new entries into first-level education, but to reduce the number of late entries and to improve the retention rate.

Wastage in the first-level system

The pyramids given in figure 1, covering public and private first-level education in urban and rural areas, give an idea of the volume of wastage. In private education, drop-out is not high, but in public education it is considerably higher, particularly in the rural areas. The base of the pyramid is wide, but it narrows rapidly as it rises, and the apex is very narrow. Drop-out is found early on from the end of grade I; the enrolment in grade II is barely half that in grade I.

TABLE 10. Breakdown by age of entry in urban and rural areas, 1968

Age	Urban Areas						Rural Areas					
		Public		Private		Total intake ratio as percentage		Public		Private		Total intake ratio as percentage
	Population	Entries	Rate	Entries	Rate		Population	Entires	Rate	Entries	Rate	
7	364 300	128 270	35.2	79 800	21.9	57.1	284 000	135 150	47.6	8 750	3.0	50.6
8	351 300	80 910	23.0	23 820	6.8	29.8	273 800	81 820	29.9	4 900	1.8	31.7
9	338 300	39 610	11.7	11 250	3.3	15.0	263 600	49 730	18.9	3 200	1.2	20.1
10	324 400	24 180	7.5	6 270	1.9	9.4	253 600	37 110	14.6	2 560	1.0	15.6
11	312 500	12 600	4.0	3 080	1.0	5.0	243 500	21 350	8.8	1 840	0.7	9.5
12	300 000	7 350	2.5	2 370	0.8	3.3	233 100	15 700	6.7	1 340	0.6	7.3
13	287 000	3 430	1.2	1 170	0.4	1.6	223 700	8 170	3.7	560	—	3.7
14	274 000	4 500	1.6	2 310	0.8	2.4	213 800	7 450	3.5	920	0.4	3.9

SOURCE Population: calculated from data supplied by *Boletín Demográfico*, op. cit.
Enrolment: estimated from the 1968 census and from data on the promotion rate by age, Ministerio de educación nacional, unpublished documents.

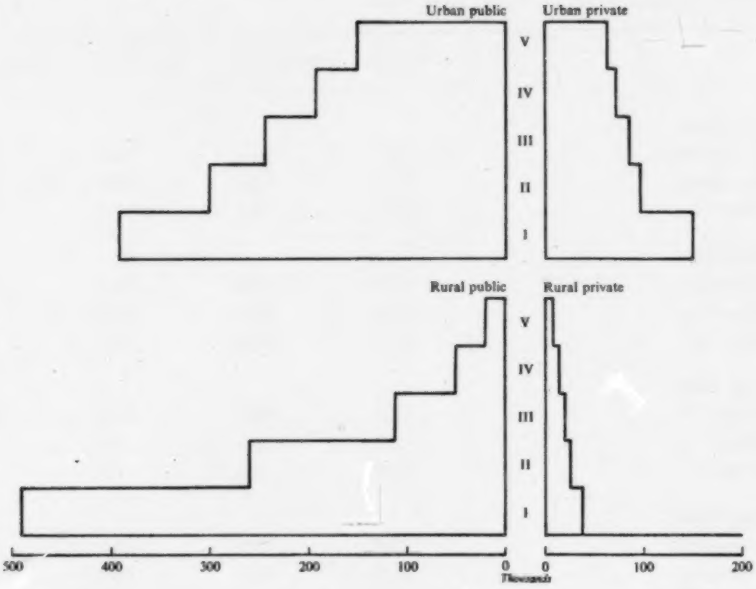

FIGURE 1. *Pyramid of first-level education, 1968*

With a view to more precise measurement of the wastage in first-level education, we have calculated (table 11) the rates of promotion, repeating and drop-out in public and private schools.

These rates confirm what has already been noted, namely the heavy drop-out in public education. Taking the public sector alone, which accounts for more than 80 per cent of total enrolments,[1] it can be said again that, out of 1,000 pupils entering first-level education, only 507 reach the level of the fifth grade in urban areas, while in the rural areas this figure is only 40.[2]

This serious wastage in rural areas, particularly after the second and third grades, is partly explained by the fact that many schools have only two or three classes (table 12).

Thus, in the rural areas nearly two-thirds of the schools have only one or two classes. The proportion of schools with the full five grades is, in fact, only 5.8 per cent.

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1. Private education is mainly developed in the urban areas; its importance in the rural areas is slight (see the pyramids given in figure 1).
2. See also table 27, p. 152,

Table 11. Rate of promotion, repeating and drop-out in public and private first-level education in urban and rural areas, 1965

	Grade I-II	Grace II-III	Grade III-IV	Grade IV-V
Public urban				
Promotion	59.7	70.4	70.3	76.1
Repeating	21.8	19.1	16.0	12.3
Drop-out	18.5	10.5	13.7	11.6
Public rural				
Promotion	36.3	24.8	37.5	45.2
Repeating	29.0	25.6	16.6	12.1
Drop-out	34.7	49.6	45.9	42.7
Private urban				
Promotion	71.3	90.5	87.0	90.6
Repeating	7.7	8.3	7.6	6.9
Drop-out	21.0	1.2	5.4	2.5
Private rural				
Promotion	49.4	71.6	79.5	76.1
Repeating	19.0	19.7	15.0	10.1
Drop-out	31.6	8.7	5.5	13.8

SOURCE Rates calculated from information given in DANE, 'La educación en Columbia', op. cit. (pp. 114, 115 and 117)

Table 12. Breakdown of public first-level schools by number of classes, 1966

Number of classes	Urban areas		Rural areas	
	Number	Percentage	Number	Percentage
1	316	4.2	775	4.6
2	588	7.7	9 897	58.8
3	711	9.3	3 604	21.4
4	953	12.5	1 580	9.4
5 or more	5 046	66.3	988	5.8
TOTAL	7.614	100.0	16 844	100.0

SOURCE Oficina de planeamiento, *Plan de desarrollo educacional 1970-74*, Ministerio de educación nacional, 1969. (Vol. I, p. 16).

In the light of this serious wastage, it is quite evident, even apart from any population growth, that considerable efforts are needed if all children are to have full first-level education.

The structure of the teaching force

In 1966, there were 67,764 first-level school teachers, of whom 52,793 were in the public schools. The average number of pupils per teacher is 35, but the situation is relatively different in the public schools and the private schools. Table 13 shows how the pupil/teacher ratio has evolved in recent years.

TABLE 13. Pupil/teacher ratio in first-level education

	1962	1963	1964	1965	1966
Public urban					
Pupils	960 950	1 018 771	1 102 249	1 160 023	1 244 312
Teachers	22 782	24 406	27 109	28 258	30 517
Pupil/teacher ratio	42	42	40	41	41
Public rural					
Pupils	708 631	767 782	797 807	795 964	808 262
Teachers	17 903	19 844	21 432	21 189	22 276
Pupil/teacher ratio	39	39	37	38	36
Private [1]					
Pupils	279 191	309 852	313 367	318 027	349 456
Teachers	12 066	13 564	13 617	13 803	14 971
Pupil/teacher ratio	23	23	23	23	23
All schools					
Pupils	1 948 772	2 096 405	2 213 423	2 274 014	2 402 030
Teachers	52 751	57 814	62 158	63 250	67 764
Pupil/teacher ratio	37	36	35	36	35

1. Private education is mainly developed in the urban areas; it is negligible in the rural areas.

SOURCE DANE, 'La educación en Colombia', op. cit., pp. 84-86.

Compared with the ratio in other developing countries, the pupil/teacher ratio is relatively satisfactory. In the public schools of rural areas, the number of pupils per teacher is tending to fall steadily. To all appearances, this results from the need to open new schools even in regions where the population is less dense.[1]

While the pupil/teacher ratio is relatively satisfactory, teacher qualifications, on the other hand, are sometimes insufficient. The breakdown of teachers by level of education is given in table 14.

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[1] The number of pupils per teacher is lower in private schools, but this may be partially explained by the existence of part-time teachers.

TABLE 14. Breakdown of first-level school teachers by their level of education, 1966

	Public education				Private education					
	Urban		Rural		Urban		Rural		Total	
Level of education	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
First level	531	1.7	3 470	15.6	114	0.8	43	5.9	4 148	6.1
Second level										
Non-graduate	6 665	21.8	7 373	33.1	2 576	18.1	166	22.9	16 780	24.8
Graduate	3 253	10.7	2 141	9.6	3 311	23.2	138	19.1	8 843	13.0
Teacher training										
Non-graduate	8 449	27.7	7 238	32.5	2 652	18.6	151	20.9	18 490	27.3
Graduate [1]	10 864	35.6	1 636	7.4	3 757	26.4	139	19.2	16 396	24.2
Third-level education										
Non-graduate	423	1.4	274	1.2	672	4.7	34	4.7	1 403	2.1
Graduate	332	1.1	144	0.6	1 165	8.2	53	7.3	1 694	2.5
TOTAL	30 517		22 276		14 247		724		67 764	

[1] A teacher is considered to be certificated only if he has completed the full cycle of six years' teacher training (four years' general studies, and two years' pedagogical training). Up to 1962 a certain number of teachers were appointed in rural areas after only four years' study.

SOURCE DANE, 'La educación en Colombia', op. cit., pp. 88-103.

In view of the different educational background of teachers, it is difficult (and somewhat arbitrary) to draw a sharp distinction between teachers who can be considered sufficiently qualified and those who cannot; particularly since, in addition to the strict level of education received, allowance must be made for the experience acquired. In order to arrive at some order of magnitude, however, it was assumed that only graduates of teacher-training colleges were qualified teachers. With this rather narrow definition, the proportion of qualified teachers is very low (24.1 per cent for the whole first-level system). Also most of them teach in urban areas (where 35.6 per cent of all teachers are graduates from teacher training, compared with 6.9 per cent in rural areas). This is partially due to the fact that in rural areas enrolments are concentrated in the bottom classes (first and second grade of first-level classes). Also, up to 1962 there was a special certificate for rural teachers, which could be obtained after four instead of six years.

This small number of teachers with the desirable training is not due to any insufficient development of teacher training, but rather to the fact that a large proportion of new graduates in this branch of education take up careers outside teaching or prefer to continue their studies. In 1968, for example, the number of teacher-training graduates was 6,400, and the number of new teachers' posts to be filled was 6,000. And yet, the number of graduates who were prepared to enter teaching was only 3,400. Many teachers also give up during the course of their career so that the wastage rate is relatively high (estimated at 4 per cent) in spite of a comparatively young teaching force.

From the point of view of remuneration, first-level school teachers are divided into five categories: teachers without tenure *(sin escalafón)*; category 4 teachers; category 3 teachers; category 2 teachers; category 1 teachers.

Assignment to a category depends on the level of education received and on teaching experience. Those with three years' second-level education or less are recruited without tenure. They may become established and enter category 4 after a certain number of years of service varying according to their level of education. Graduates from teacher-training colleges, conversely, start directly in category 2 and can be rapidly promoted to category 1. In spite of this, the teaching profession is in some disfavour no doubt because the salary range in category 1 is not wide enough and does not afford normal career prospects.

In spite of the efforts made by the Ministry of Education to harmonize teachers' pay, there are wide discrepancies between the different provinces. Table 15 shows the breakdown of teachers between the different categories and their annual remuneration in two extreme provinces (Valle where the pay is highest, and Narino where it is lowest).

The Colombian authorities are greatly concerned by the insufficient qualification of teachers. The 1970-74 plan recommends the discontinuance of the recruitment of unestablished teachers and the institution of in-service training and refresher courses with a view to progressively raising the level of qualification of existing teachers. With regard to the recruitment of new teachers, it recom-

TABLE 15. Breakdown of public first-level school teachers by category, and average annual pay in the provinces of Valle and Narino, 1969

	Without tenure	Category 4	Category 3	Category 2	Category 1	Total
Number of teachers (whole country)	12 755	4 348	7 529	19 976	17 067	61 675
Average pay (1969 pesos)						
Valle	15 600	17 316	17 628	18 382	20 462	—
Narino	8 060	10 400	11 440	13 000	15 600	—

SOURCE Informes de Secretarías de educación, Oficina de planeamiento, Ministerio de educación nacional, Bogota.

mends reforms in teachers' pay with a view to attracting and retaining a greater number of teacher-training graduates.

The cost and financing of first-level education

Although in 1968 private first-level education represented about 19 per cent of the total for the whole country and an even higher percentage in urban areas, data available are too fragmentary to allow an assessment of its cost and sources of finance, and the following comments are therefore confined to public education.

The sources of finance for public first-level education

Public first-level education is free; the three main sources of finance are the state, the provinces and the municipalities. The share of these three sources has evolved in recent years as shown in table 16.

The share of the provinces, which was relatively high in 1962, fell steadily until 1964, after which it increased slightly and became stabilized. This diminution in the role of the provinces is partly due to the fact that their revenue has not grown as fast as the expenses they have to meet; particularly educational expenditure. The state share has therefore grown. It seems likely to grow even more in future, in the light of the present objectives of the plan (narrowing the gap between the different provinces, improving the level of teacher qualification, harmonizing and improving teachers' pay). The share of the municipalities, on the other hand, has always been relatively low.

The financing of capital expenditure on first-level education is not known with precision, since, in addition to the three public sources previously cited, certain decentralized establishments, especially the ICCE (Instituto colombiano de construcciones escolares) also share in this expenditure. The role of the ICCE is,

TABLE 16. Share of the different sources of finance for recurrent expenditure on public first-level education, 1962-67 (in millions of current pesos)

Year	Central Government		Provinces		Municipalities[1]		Total
	Amount	Percentage	Amount	Percentage	Amount	Percentage	
1962	118.3	34.8	180.2	53.0	41.4	12.2	339.9
1963	200.2	44.7	200.6	44.8	47.0	10.5	447.8
1964	266.8	51.7	199.2	38.6	49.7	9.7	515.7
1965	267.2	45.7	267.3	45.7	49.9	8.6	584.4
1966	323.7	42.7	359.9	47.5	74.6	9.8	758.2
1967	351.3	43.5	377.7	46.8	78.0	9.7	807.0

1. Including Bogota.

SOURCE Expenditure calculated from the appropriation accounts of the state, provinces and municipalities. Expenditure is estimated net of transfers received.

moreover, becoming increasingly important as the sponsoring authority for first-level school building.

The cost of first-level education

The unit costs of first-level education have evolved in recent years as given in table 17. In order to eliminate the effects of the rise in prices, which has been very rapid over the period, the costs are shown both in current pesos and in constant 1966 pesos. In should also be noted that these costs do not include capital expenditure.

TABLE 17. Unit costs in public first-level education

Year	Enrolments (thousands)	Current pesos		Constant 1966 pesos	
		Expenditure (millions)	Unit costs (pesos)	Expenditure (millions)	Unit costs (pesos)
1962	1 670	339.9	203.5	596.2	357.0
1963	1 788	447.8	250.6	628.3	351.6
1964	1 900	515.7	271.4	667.3	351.2
1965	1 956	584.4	298.8	711.0	363.5
1966	2 053	758.2	369.3	758.2	369.3
1967	2 136	807.0	377.8	795.0	372.2

SOURCE Enrolments: DANE, 'La educación en Columbia,' op. cit., p. 84.

Expenditure: see table 16. (Expenditure in constant 1966 pesos has been obtained by deflating current expenditure by the index for 'public services' calculated by the national accounts department of the Banco de la Republica.)

While unit costs in current pesos have tended to grow steadily, in constant pesos, they have shown remarkable stability between 1962 and 1967, the deviation between the two years being barely 4 per cent.

Teachers' pay naturally accounts for a very high proportion of the unit costs of first-level education. The 1970-74 plan estimates it at 93 per cent.

As we have already indicated, the capital costs of first-level education are not known with precision for the past. With regard to the present position, according to the standards laid down by the ICCE for 1968, the average cost of a first-level classroom is 38,850 pesos in the urban areas and 49,650 pesos in the rural areas.

The following provisional conclusions can be drawn from this brief analysis of the development of first-level education. From the point of view of entries, allowing for late entry, it can be said that in both the rural and urban areas, all children with varying degrees of delay end up by entering first-level school. The problem which Colombia now has to face is, therefore, essentially that of improving the retention rate. Although there are only five grades in first-level education, the drop-out rates are particularly high in the rural public schools[1] and a reduction in these rates, if sufficient classes and teachers were provided, would mean a substantial increase in numbers.

The level of teacher qualification is not, in general, satisfactory. It is particularly low in rural public education. And yet, nearly half the new teacher-training graduates prefer to take up careers outside teaching, apparently because the salary scales are thought to be too low.

The government's present policy is to improve the retention rates in first-level education and to improve teacher qualifications. This policy will obviously lead to increased expenditure, which will be all the greater since the population growth and particularly the growth of the school-age population, will be relatively large in future years. Looking at the longer term, and taking into account financial constraints, the possibility of improving the quality of first-level education will eventually depend on the speed at which enrolments increase and, therefore, on the growth rate of the school-age population. This is what we shall try to show in part III.

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[1] See figure 1, p. 135. Out of 1,000 pupils entering rural public first-level schools only forty reach the fifth class.

III The effect of population growth on educational expenditure

In order to measure the effect of population growth on educational expenditure, we shall analyse successively the size of that growth, especially the growth of the school-age population, its effect on the increase of enrolments and on the need for teachers, and, finally, its influence on the increase of expenditure over the next two decades.

Population growth

The population of Colombia was estimated in 1970 at 22,160,000, the fourth largest in Latin America after Brazil, Mexico and Argentina. Colombian population growth has always been vigorous. It has nevertheless speeded up since 1945, and the annual growth rate is in the neighbourhood of thirty-five per thousand, one of the highest in the world (table 18).

TABLE 18. Trend of total population, 1920-69

Year	Population (thousands)	Annual growth rate (percentage)	Year	Population (thousands)	Annual growth rate (percentage)
1920	6 057	—	1960	15 877	3.27
1930	7 350	1.96	1965	18 692	3.33
1940	9 077	2.13	1966	19 332	3.42
1945	10 202	2.36	1967	19 995	3.42
1950	11 629	2.65	1968	20 686	3.45
1955	13 516	3.06	1969	21 407	3.48

SOURCE *Boletin demográphico*, op. cit. p. 4.

This acceleration of population growth is due to the maintenance of a high gross birth rate (at present estimated at 44.6 per thousand) and a rapid fall in the gross death rate, which now lies at 10.6 per thousand.[1]

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[1] See *Boletín demográfico* op. cit., p. 30.

Owing to this high birth-rate, the population of Colombia is very young. The proportion of young people under twenty has risen from 56.7 per cent in 1965 to 57.5 per cent in 1970. This gives an idea of the special effort required of the nation for educational development.

TABLE 19. Population under twenty and total population (in thousands)

	1965			1970		
Age	Boys	Girls	Total	Boys	Girls	Total
0-4	1 765	1 722	3 487	2 107	2 036	4 143
5-9	1 471	1 437	2 908	1 716	1 677	3 393
10-14	1 186	1 161	2 347	1 460	1 427	2 887
15-19	914	951	1 865	1 176	1 152	2 328
Population under 20			10 607			12 751
Total population			18 692			22 160
Percentage under 20			56.7			57.5

SOURCE *Boletín demográfico*, op. cit., pp. 14-18.

With regard to future population growth, J. Arevalo and A. Ortega, in connexion with the CELADE population studies, have constructed three projections.[1] They are based on the same assumption of a falling death-rate. Expectation of life at birth is assumed to follow the trend set out in table 20 over the next two decades.

TABLE 20. Expectation of life at birth

	1965-70	1975-80	1985-90
Men	56.9	61.1	66.0
Women	60.2	64.7	69.4

The three projections are, however, based on three different assumptions as to fertility, namely a rapid fall, a moderate fall, and a slow fall. In terms of gross reproduction rate, these assumptions are reflected in the figures given in table 21.

The plausibility of each of these three assumptions will quite clearly depend on the success of the government's present birth control policy. This policy is nevertheless encountering a certain hostility, especially from the ecclesiastical

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[1] J. Arevalo and A. Ortega, *Colombia: Proyecciones de población por sexo y grupo de edades, 1965-2000*, Santiago, CELADE, 1968.

TABLE 21. Gross reproduction rate

	1965-70	1975-80	1985-90
Assumption I (rapid fertility decline)	3.04	2.40	1.76
Assumption II (medium fertility decline)	3.20	2.93	2.35
Assumption III (slow fertility decline)	3.20	3.20	2.93

authorities, as shown by this declaration of the general assembly of the episcopate, meeting at Medellin in September, 1968:

> 'The general population explosion in Indo-America is largely due to the high percentage of casual unions and illegitimate births, the " veritable scourge of the sub-continent whose marriage rates are the lowest in the world ".
>
> The solution of birth control is an over-simplified, immoral and materialistic solution, particularly when it takes the form of a prior condition for assistance from external economic organizations.' [1]

Be that as it may, table 22 shows the population trend of Colombia under the three demographic assumptions.

TABLE 22. Population trend in Colombia given different assumptions of population growth, 1965-90 (in thousands)

Age group	Population in 1965	Population in 1980			Population in 1990		
		Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
0-4	3 487	4 668	5 670	6 082	5 122	6 931	8 801
5-9	2 909	4 229	4 824	4 907	4 960	6 285	7 294
10-14	2 347	3 857	4 013	4 013	4 591	5 589	5 995
15-19	1 865	3 358	3 358	3 358	4 203	4 794	4 877
20-24	1 524	2 848	2 848	2 848	3 826	4 000	4 000
25-29	1 292	2 290	2 290	2 290	3 325	3 325	3 325
30-34	1 112	1 807	1 807	1 807	2 815	2 815	2 815
35-39	955	1 466	1 466	1 466	2 252	2 252	2 252
40-44	793	1 228	1 228	1 228	1 764	1 764	1 764
45-49	642	1 034	1 034	1 034	1 407	1 407	1 407
50-54	531	856	856	856	1 149	1 149	1 149
55-59	401	671	671	671	931	931	931
60-64	305	496	496	496	724	724	724
65-69	208	354	354	354	517	517	517
70 and over	332	431	431	431	647	647	647
TOTAL	18 702	29 593	31 366	31 841	38 233	43 130	46 498

Assumption I: rapid fertility decline, low population growth
Assumption II: medium fertility decline, medium population growth
Assumption III: slow fertility decline, high population growth

SOURCE J. Arevalo and A. Ortega, op. cit. pp. 3-8.

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[1] Cited in ' Problèmes d'Amérique Latine, Colombie 1969 ', in *Notes et études documentaires*, Paris, 17 October, 1969, p. 28.

One assumption only has been taken for the death-rate, it is, therefore, the characteristics of the birth-rate which differentiate these three projections.

TABLE 23. Annual growth rate of school-age and of working-age population 1970-90

	1970-75	1975-80	1980-85	1985-90
Population aged 5 to 9				
Assumption I	2.7	1.8	1.8	1.4
Assumption II	3.6	3.5	3.0	2.3
Assumption III	3.6	3.9	4.1	3.9
Population aged 10 to 14				
Assumption I	3.2	2.7	1.8	1.8
Assumption II	3.2	3.6	3.6	3.0
Assumption III	3.2	3.6	3.9	4.1
Population aged 15 to 59				
Assumption I	3.7	3.7	3.5	3.4
Assumption II	3.7	3.7	3.7	3.7
Assumption III	3.7	3.7	3.7	3.8

SOURCE Calculated from the data indicated by J. Arevalo and A. Ortega, op. cit., pp. 3-8.

The three different population trends have a marked effect on the growth of the school-age population; the growth rate of the population between 5 and 9, for example, varies between 1.4 per cent and 3.9 per cent (nearly in the ratio of 1 to 3) over the period 1985-90. On the other hand, they scarcely affect the working-age population. Their incidence on the labour supply, and consequently on the growth of production is therefore the same.[1] In other words, under assumption I, the slowing down of the growth in the school-age population reduces the pressure from demographic sources on educational expenditure, whereas production, and therefore GDP, will not be affected, at least directly. The result is that the financing of educational expenditure will come under less pressure under assumption I than under assumption II, or *a fortiori*, assumption III.

As will be seen below, the projection of future enrolments is based on new entries and on retention rates. The number of children aged 7 (the official age of entry into first-level education) therefore constitutes an essential datum. Furthermore, the situation is very different in the rural areas than in the urban areas. We must therefore try to distinguish between the population trend of the rural and of the urban areas.

Migration from the rural areas to the urban areas has been considerable in the past. Table 24 gives the trend of urban and rural population over the past two decades.

[1] Labour supply is, of course, not the only factor which influences production. Consumption may also be an important factor, and this depends on the trend of total population and not of working-age population.

TABLE 24. The trend of urban and rural population (in thousands)

	1950	1960	1970
Urban population	4 068	7 458	12 785
Rural population	7 561	8 419	9 375
Urban population as percentage	35.0	47.0	57.7

As early as 1964 the urban population was already higher than the rural population. For the future, we have adopted an assumption under which migration from rural areas will tend to slow down.[1]

The effect of migration from the rural to the urban areas on the trend of the 7-year-old population in each of these areas is extremely complex. Because of lack of data, we have taken the distribution between urban and rural areas of children aged 7 to be the same as that of the total population.

TABLE 25. Trend of population aged 7 in urban regions on different assumptions of population growth

Year	Assumption I	Assumption II	Assumption III
1970	397 606	397 606	397 606
1971	419 254	419 254	419 254
1972	440 434	440 434	440 434
1973	456 059	462 546	462 546
1974	472 092	485 653	485 653
1975	482 049	503 183	503 183
1976	492 297	522 873	524 488
1977	502 514	543 287	546 680
1978	512 933	564 530	569 814
1979	523 555	586 562	593 951
1980	534 207	609 476	616 765
1981	545 329	630 052	646 439
1982	556 672	651 298	675 377
1983	568 238	673 280	705 607
1984	580 027	695 944	737 142
1985	592 083	719 456	770 385
1986	602 837	738 585	803 387
1987	613 765	758 181	837 742
1988	624 928	778 319	873 538
1989	366 268	799 010	910 866
1990	647 811	819 825	950 052

Assumption I: Low population growth
Assumption II: Medium population growth
Assumption III: High population growth

SOURCE See table 23.

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[1] We had also adopted a second assumption under which migration would continue at nearly the same rate as in the past. It does not, however, appear in this report since the increase in enrolment, due to higher retention rates in urban areas, would be partially absorbed by the private sector which is more developed in urban than in rural areas. The difference in public cost therefore is not very substantial.

On this assumption, we have been able to construct in table 25 the projection of the trend of children aged 7 in the urban areas over the next two decades.

Projection of enrolments

The following comments are limited to public education. The costs and expenditure of private education are in fact known only very imprecisely and any estimate of the future expenditure of private education can only be very approximate.

We shall start by estimating new entries into the system, and then go on to projections of enrolments proper.

Projection of new entries

As we have seen in part II late entry both in urban and rural areas is very common.[1] The current plan (1970-74) aims at a rapid reduction in these late entries; the target is to enrol by 1974 all children aged 7 and only those aged 7, since the problem of late entries should have been resolved.

In 1968 entries at all ages, expressed as a percentage of the 7-year-old population in urban areas were 82.6 in public education and 35.6 in private education, adding up to 118.2 per cent. Naturally, once late entries are absorbed and only 7-year-old children are admitted, this percentage will go down to 100.

Overall, the private system in urban areas enrols 30 per cent of total new admissions.[2] We have assumed that this proportion would remain stable until 1974. As a result of efforts to reduce late entries, therefore, the intake ratio of children aged 7 in the urban areas will tend to grow steadily from the 1968 level of 35.2 per cent in public schools and 21.9 per cent in private schools to reach in 1974 70 per cent in public schools and 30 per cent in private schools. After that date the growth in admissions will be more moderate, strictly following the population growth. However, as the standard of public first-level education will have improved, we have assumed that the intake ratio of public education will grow slightly from 1974 onwards, with the result that entry into private education will not increase as fast as the population growth.

In the rural areas, the intake ratio of public education will level off at 95 per cent. The part played by private education is negligible in these areas.

Naturally, as entry at the official age increases, the proportion of late entry will tend to fall. In the light of the past situation and the targets of the current plan, we have projected the rates of entry into public first-level education by age as shown in table 26.

It will be noted that, in order to obtain the total rate of entry of a cohort, the entry rates must be added ' diagonally '; e.g., the total entry rate of the cohort

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[1] See page 133.

[2] *Censo de establecimientos educativos*, op. cit.

TABLE 26. Rate of entry into public first-level education by age

Age	1968	1969	1970	1971	1972	1973	1974	1975
Urban areas								
7	35.2	*38.0*	42.0	47.0	52.0	60.0	70.0	71.2
8	23.1	21.0	*19.0*	17.0	16.0	13.0	10.0	—
9	11.7	11.0	9.5	*9.0*	8.0	7.0	5.0	—
10	7.5	6.0	4.0	3.0	*3.0*	2.0	—	—
11 and over	9.3	6.0	4.0	2.0	—	—	—	—
Rural areas								
7	47.6	*55.0*	63.0	74.0	82.0	90.0	95.0	95.0
8	30.0	27.0	*22.0*	17.0	12.0	8.0	5.0	—
9	20.0	17.0	16.0	*14.0*	12.0	8.0	5.0	—
10	15.0	10.0	5.0	4.5	*4.0*	3.0	1.0	—
11 and over	21.0	15.0	10.0	2.0	0.5	—	—	—

SOURCE 1968: see table 9
1969: estimates
1970-75: IIEP projection

born in 1962 is equal to the sum of the entry rates of children aged 7 in 1969, children aged 8 in 1970, children aged 9 in 1971, and children aged 10 in 1972.

Figure 2 (overleaf) shows the trend of entry of children aged 7 in the medium population assumption to urban first-level education and the gradual resorption of late entries in both public and private schools.

The existence of late entries can be attributed to different factors and it is likely that their resorption will take longer than estimated in the plan. If it were to be longer, however, it would not make a substantial difference: it would simply mean that the admission curve would meet the 7-year-old population curve somewhat later.

In order to bring out the effect of population growth on the growth of entries, we have shown in figure 3 the trend of admissions on the three population assumptions.[1]

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[1] The numerical data for these graphs will be found in the appendix, tables 1 and 2.

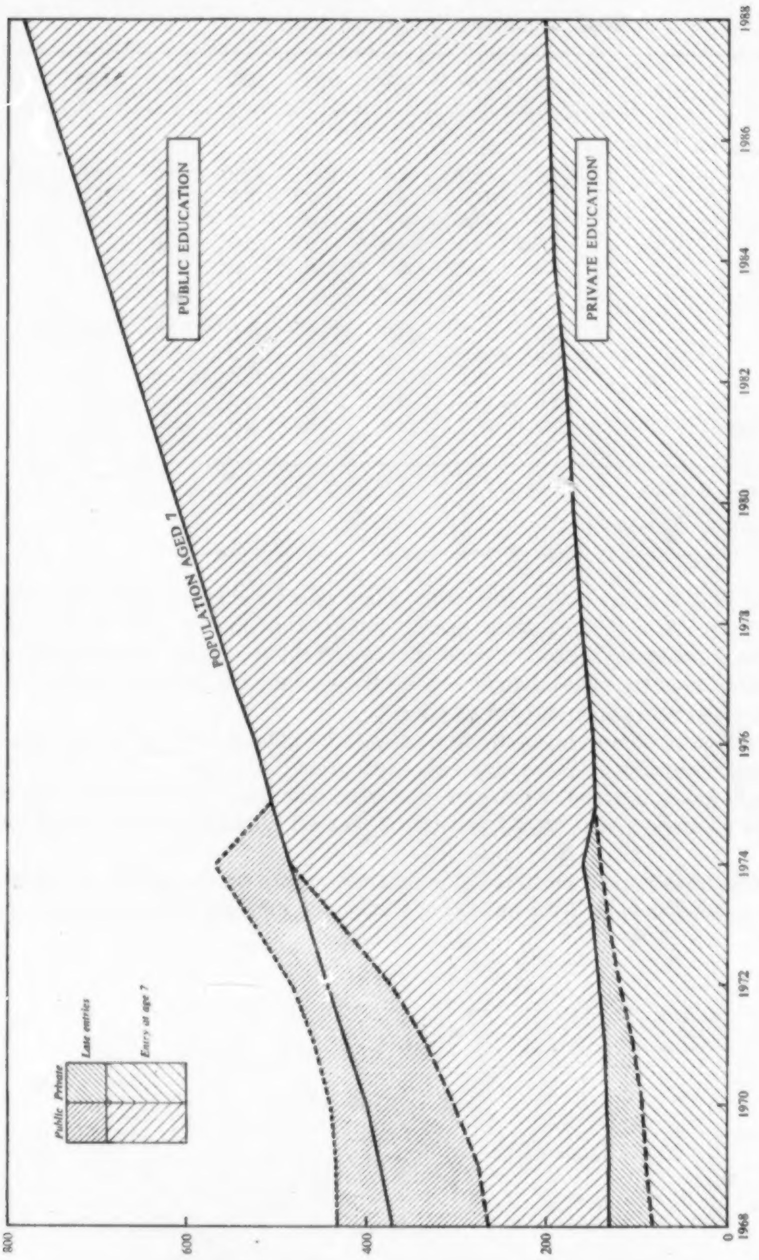

FIGURE 2. *Trend of entry of children aged 7 in urban first-level education: resorption of late entries* (thousands)

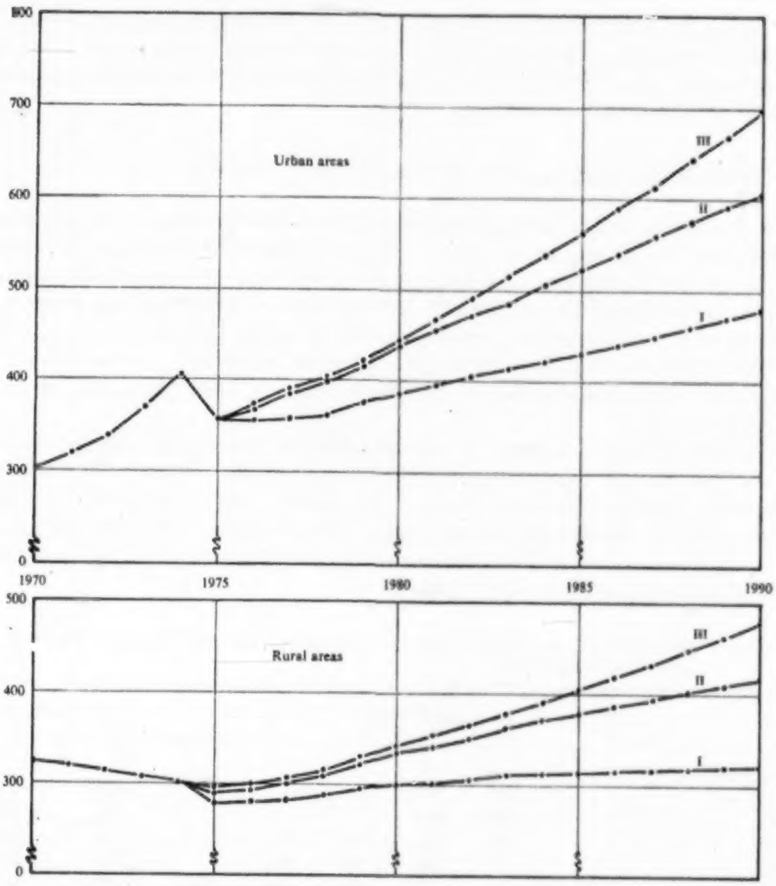

FIGURE 3. *Trend of entries in public education in urban and rural areas given three population growth assumptions* (thousands)

These graphs call for the following comments. In the urban areas entries will grow steadily until 1974, and will fall in 1975 owing to the elimination of late entries. They will then increase with population growth. In the rural areas, where late entries are numerous, their gradual elimination will mean a steady fall in entries up to 1975. After that date, they, too, will follow the population trend.

The deviation between the different population assumptions will not become evident until after 1975. Until 1980, moreover, the difference between assumption II and assumption III is very small. It will subsequently become more marked.

The fall in entries between 1974 and 1975 will not involve a corresponding fall in total enrolments, which, allowing for repeaters, depend on the entries for seven consecutive years. The result is that fluctuations in entries are largely absorbed if total enrolments are considered.

Projection of enrolments in public first-level schools

The projection of first-level enrolments is based on the new entries calculated above, and on the rate of retention. Since first-level education lasts five years, assuming that the number of children who repeat more than twice during those five years is negligible, it can be said that the total enrolments in any given year depend on entries during the preceding seven years and the retention rate. The retention rate can be defined as the proportion of a cohort (entering school the same year) which still remains in the system after one, two, three, four, five, six and seven years.

From the available statistics, it was only possible to calculate average rates of promotion, repetition and drop-out at the different grades. These rates obviously cannot be considered as the real rates of one cohort — we have therefore adjusted them, assuming that the maximum number of repetitions is two.[1] The behaviour of a theoretical cohort of 1,000 pupils entering public first-level education in 1963 can be reconstituted as shown in table 27.

TABLE 27. Behaviour of a theoretical cohort of 1,000 pupils in public first-level education in urban and rural areas

Year	Grade I	Grade II	Grade III	Grade IV	Grade V	Total	Retention rate
Urban areas							
1963	1 000					1 000	1.000
1964	234	594				828	0.828
1965	55	263	418			736	0.736
1966		87	264	306		657	0.657
1967			111	239	234	584	0.584
1968				118	211	329	0.329
1969					115	115	0.115
Rural areas							
1963	1 000					1 000	1.000
1964	321	366				687	0.687
1965	103	223	91			417	0.417
1966		102	74	35		211	0.211
1967			40	33	16	89	0.089
1968				20	18	38	0.038
1969					12	12	0.012

SOURCE Calculation based on observed rates of promotion, repeating and drop-out. See appendix, table 1.

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[1] For more details about the methods of estimating the real rates of a cohort from the average rates in the various grades, see page 312.

In view of the high rates of repeating and drop-out (especially in the rural areas), the government is making a special effort to improve the efficiency of first-level education. This effort is reflected, in particular, by an improvement in the level of teacher qualification. We have assumed that this effort will be successful and will result in an improved promotion rate and lower rates of repeating and drop-out. The forecast trend of these rates for urban and rural areas is given in appendix, table 1.

On the basis of these rates, we have been able to reconstitute theoretical cohorts and to calculate retention rates. By way of illustration, table 28 shows the trend of the retention rate for urban public first-level schools for the period 1970-76.

TABLE 28. Retention rate in urban public first-level schools of children entering in year *n*

Year (*n*)	*n* + 0	*n* + 1	*n* + 2	*n* + 3	*n* + 4	*n* + 5	*n* + 6
1970	1 000	880	802	741	689	358	*156*
1971	1 000	885	813	756	707	*355*	139
1972	1 000	890	824	772	*726*	351	122
1973	1 000	895	835	*788*	745	344	113
1974	1 000	900	*848*	804	764	337	105
1975	1 000	*905*	853	813	777	330	99
1976	*1 000*	910	858	822	790	322	93

NOTE The figures in columns *n* + 1 to *n* + 4 increase owing to the fall in drop-out rates; those in columns *n* + 5 and *n* + 6, which correspond to a school lag of 1 to 2 years, fall because of the reduction in repeating.

SOURCE IIEP projection.

Since there are five first-level grades, and since we have assumed that the number who repeat more than twice during these five years is negligible, the total enrolments in 1976, for example, will depend on the number of entries for the years 1970 to 1976. The retention rates must, however, be read ' diagonally ' (figures in italic in table 28). Thus the total enrolments in urban public education in 1976 will be made up of 100 per cent of the 1976 entries, 90.5 per cent of the 1975 entries, 84.8 per cent of the 1974 entries, and so forth.

The appendix includes detailed projections of enrolments on the three assumptions of population growth. Figure 4 however, gives an idea of the growth in enrolments between 1968 and 1989.

The effect of the three population projections on the level of enrolments only becomes evident from 1979 onwards, and even at that date the difference between the high projection and the medium projection is relatively slight. It is only in 1989 that the deviations really begin to make themselves felt. If the 1989 enrolments are compared with those for 1968, it is found that, in the urban areas, they are multiplied by 1.83 on the lowest assumption and by 2.50 on the highest assumption. In the rural areas these figures are 1.64 and 2.23 respectively.

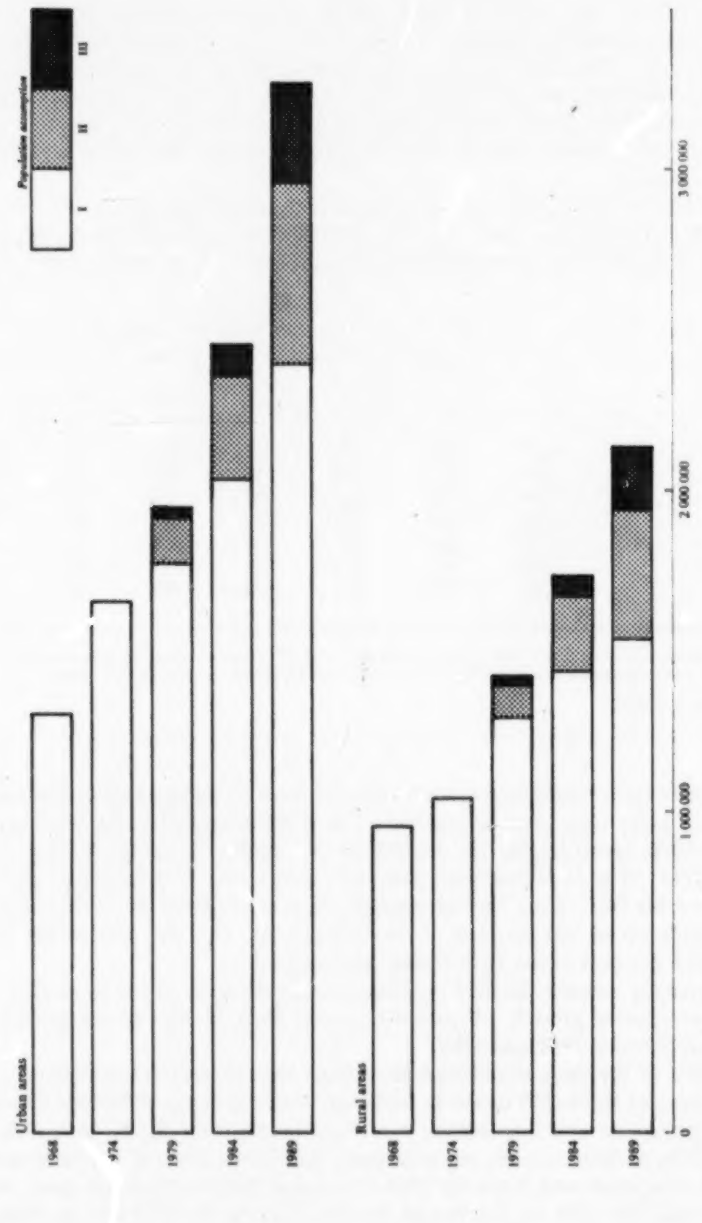

FIGURE 4. *Projection of enrolments in public first-level schools given three population growth assumptions*

This increase in enrolments is due partly to population growth, shown by the increase in new entries, but is also partly due to improved retention rates. This is particularly true in the rural areas. As we have already noted, owing to migration from the rural areas to the urban areas, the increase in new entries in the rural areas is relatively slight on all three population assumptions. The greater part of the increase in enrolments is due to improved retention rates.

Figure 5, which compares the pyramid of enrolments in 1968 and in 1989, on the assumption of medium population growth, clearly shows the improvement in first-level education. In rural public education, for example, the gap between enrolments in grade I and grade V, which was enormous in 1968 owing to drop-out in successive classes, will be much less in 1989. On the other hand, enrolment in grade I will be smaller in 1989 than in 1968. This is not due to any decline in new entries (which will in fact increase slightly) but to a reduction in the number of repeaters. It should also be noted that new entries in 1968 were partly swollen by the number of late entries.

An improvement in the retention rate, although less marked, is also found in the pyramid of urban public education (figure 5).

Projection of the supply of and the demand for teachers

We shall project successively the need for teachers over the period, the number of teachers to be recruited year by year and the trend of the structure of the teaching force in public first-level education.

Projection of total needs for teachers

In 1966 the pupil/teacher ratio was thirty-nine to one in public first-level education (forty-one in urban areas and thirty-six in rural areas).[1] The 1970-74 plan proposes that this ratio shall be progressively brought down to an average of thirty-five pupils per teacher. This is the ratio we shall use in projecting the future need for teachers.

Figure 6 shows the trend of the need for teachers on the different population growth assumptions.[2] As in the case of enrolments, the effects on the need for teachers of the different fertility trends expressed by the three population growth assumptions will not begin to be felt until 1979 and, even at that date, the difference between the medium assumption and the high assumption will remain fairly small. In 1989 the difference will, of course, have become much greater.

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[1] It should be noted that the pupil/teacher ratio is substantially lower in private education.

[2] The numerical data for this graph are given in appendix, table 5.

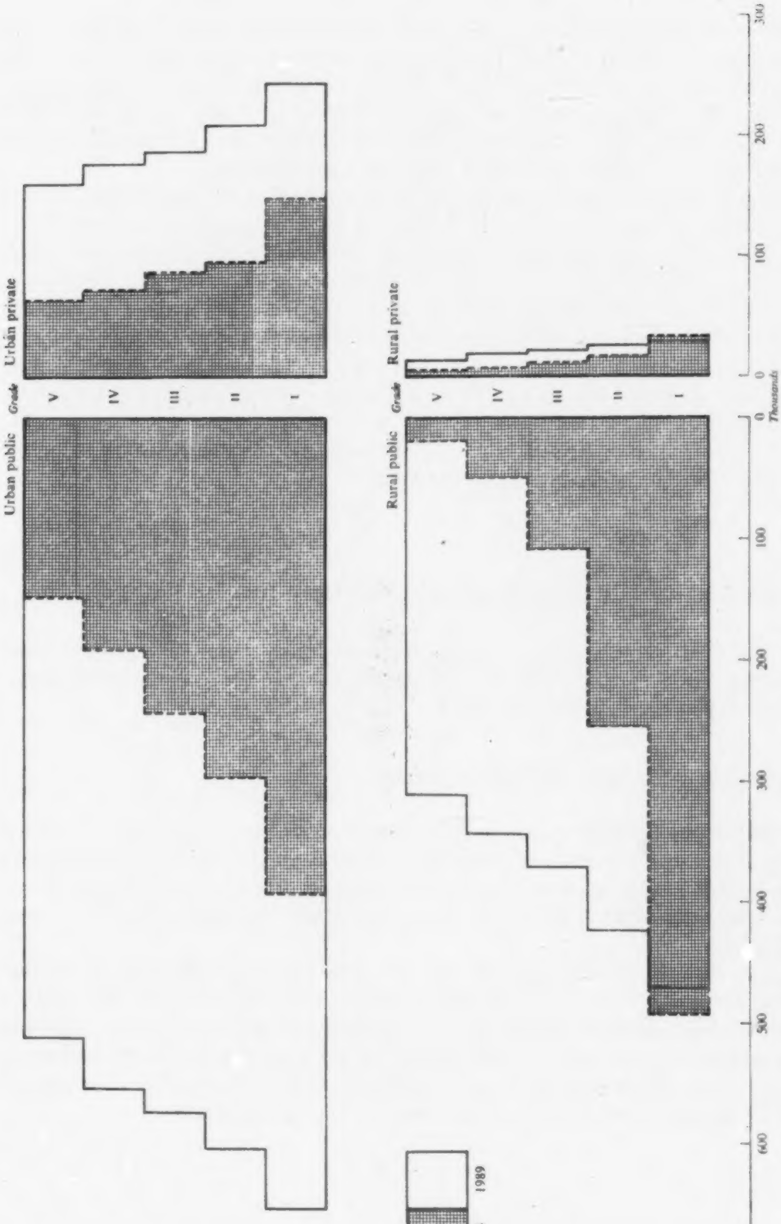

FIGURE 5. *Comparison of pyramids of first-level education in 1968 and 1989 (medium population growth)*

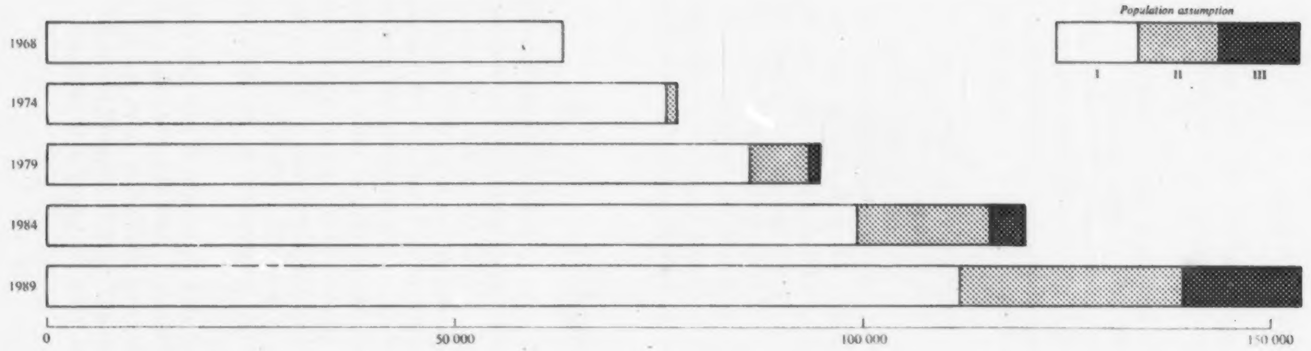

FIGURE 6. *Projection of the need for teachers given three population growth assumptions*

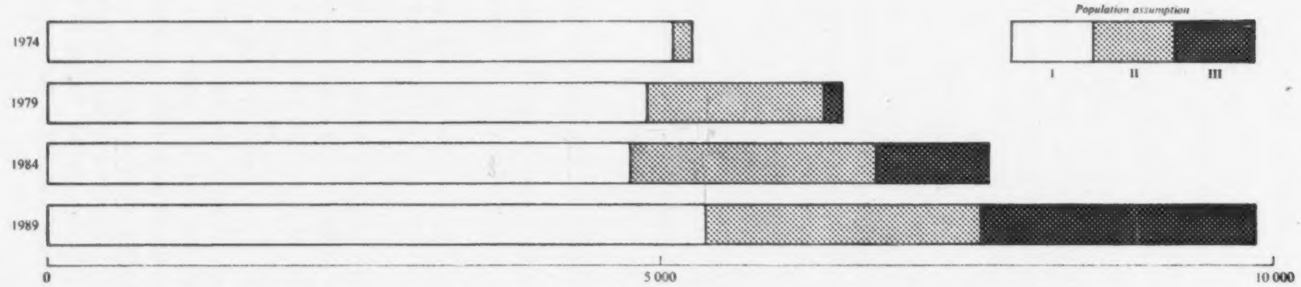

FIGURE 7. *Projection of the number of teachers to be recruited given three population growth assumptions*

Projection of the number of teachers to be recruited

Given the trend of the need for teachers and the proportion who give up in the course of their career, it is possible to project the number of teachers to be recruited.

In Colombia, the proportion of teachers who give up is relatively high. The plan estimates it at 4 per cent per annum. We have adopted this rate for the existing stock of teachers in 1969. For teachers recruited from 1970 onwards we have taken a lower rate. We have assumed that the new teachers' pay policy designed, in particular, to enlarge the salary range of category 1 teachers and give them genuine career prospects in teaching, will have the effect of reducing the number who give up.

The trend in the number of teachers to be recruited on the different population growth assumptions is shown in figure 7. It is interesting to compare this figure with the preceding one showing the trend of the total need for teachers. While the total need for teachers grows steadily on all three population assumptions, the number to be recruited varies more widely. The number to be recruited in fact depends on the *pace* at which needs increase. If this pace slows down, the number of teachers to be recruited falls. Thus, in the case of low population growth, the number of teachers to be recruited tends to fall between 1974 and 1984 and to increase slightly between 1984 and 1989. It should also be noted that the differences between the three assumptions become much greater, especially for 1989. Here, indeed, the number to be recruited on the high assumption is double that of the low assumption.

Projection of the structure of the teaching force

As we have seen in part II, there are five categories of teachers, those without tenure and categories 4, 3, 2 and 1. Teacher-training graduates are recruited direct into category 2 and promoted to category 1 after two years. In spite of this favourable treatment, only half of such graduates choose to go into teaching. Furthermore, the number who give up in the course of their career is substantial.

The unpopularity of a teaching career is partly due to the relatively low level of teachers' pay as a whole, and partly to the fact that category 1 does not afford career prospects. It is for this reason that the Ministry of education has adopted a policy of reforming teachers' pay, by narrowing the discrepancies which exist between provinces, by progressively increasing pay in all categories, and by widening the salary range in category 1. Up to now, all teachers in this category receive equal pay, regardless of length of service.

With this new pay policy, we have assumed that in future all new teachers recruited will come from the teacher-training colleges. With regard to the stock of teachers existing in 1969, in view of the existing promotion rules, we have assumed that the average time needed for promotion from one category to another is as follows: without tenure to category 4, six years; category 4 to category 3, six years; category 3 to category 2, five years.

TABLE 29. Projection of the structure of the teaching force

Year	Population assumption	Without tenure	Cat. 4	Cat. 3	Cat. 2	Category 1				Total
						0-4	5-9	10-14	15-19	
1969		12 755	4 348	7 529	19 976	17 067 [1]	—	—	—	61 675
1979	Assumption I	—	3 063	6 456	11 471	27 154	38 456	—	—	86 600
	Assumption II	—	3 063	6 456	14 071	31 066	38 744	—	—	93 400
	Assumption III	—	3 063	6 456	14 315	31 414	38 744	—	—	93 992
1989	Assumption I	—	—	—	12 683	27 694	21 625	21 533	27 555	111 090
	Assumption II	—	—	—	17 277	38 051	29 174	24 728	27 790	137 020
	Assumption III	—	—	—	21 558	45 522	31 322	25 013	27 790	151 205

Assumption I: low population growth
Assumption II: medium population growth
Assumption III: high population growth
SOURCE IIEP projection.

[1] In 1968, in any one province all category 1 teachers earned the same salary regardless of the length of service. Since a salary scale for category 1 teachers will not be introduced until 1970, we have assumed that the whole group will be placed on step 1.

Since category 1 teachers will be remunerated according to length of service, we have divided them into four sub-groups (0-4, 5-9, 10-14 and 15-19 years' service).

On these assumptions, the structure of the teaching force in 1979 and 1989 can be projected as shown in table 29 on the different population growth assumptions.

With the policy of recruiting only teachers from teacher-training colleges from 1970 onwards, the structure of the teaching force will be profoundly modified. Owing to promotion from one category to another and partly to giving up, there will be no more teachers without tenure after 1979. The number of teachers in categories 4 and 3, from the 1969 stock will tend to fall. Finally, category 1 teachers with 5 to 9 years' service, coming from the 1969 stock or recruited between 1970 and 1972, will be the same on all three population assumptions. Any differences between the three assumptions will only affect category 2 teachers or category 1 teachers with 0-4 years' service.

The change in the structure of the teaching force will be even more marked in 1989, since all the teachers of the 1969 stock will either have given up or have been promoted into category 2 or 1. Twenty years after the application of the policy of recruiting only from teacher-training colleges, it can be said that the whole of the teaching force will be fully qualified. If all category 2 and 1 teachers are considered to be qualified [1] the percentage of qualified teachers will rise from 60 per cent in 1969 to 89 per cent in 1979 and 100 per cent in 1989.

Projection of expenditure

Cost of public first-level education

We shall successively project the cost of first-level education and the cost of teacher training.

RECURRENT COSTS

Teachers' pay accounts for the bulk of the cost of first-level education, amounting to 93 per cent of total expenditure. Salaries, however, differ from province to province. Table 30 shows the weighted average salary for the different categories of teachers for all provinces in 1966.

Between 1966 there have been pay increases, but they have scarcely kept pace with rising prices, so that there has been no real increase, and even in some cases a slight reduction. This pay stagnation is no doubt one of the reasons for the unpopularity of teaching as a career.

In the light of what has been said above about the recommended pay policy, we have assumed for the future an overall pay increase of 1.5 per cent per annum.[2]

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[1] This is not strictly accurate, in so far as, up to 1969 even uncertificated teachers could, after a fairly long period, be promoted to category 2 and even category 1.

[2] Corresponding to the annual increase of GDP per working-age population (15-60).

TABLE 30. Weighted average annual salary of different categories of teachers, 1966 (in pesos)

Category	Salary	Category	Salary
Without tenure	9 100	Category 2	14 950
Category 4	11 700	Category 1	16 900
Category 3	13 000		

SOURCE Ministry of Education, unpublished document.

Furthermore, in order to offer career prospects to teachers recruited direct from teacher-training colleges who start immediately in category 2 and rise rapidly to category 1, the latter has been broken down into four sub-categories, in accordance with present projects.

In order to be able to compare educational costs with other economic data (which are generally expressed in constant 1966 prices), we have projected all costs in 1966 pesos. The projection for 1979 and 1989 is given in table 31.

TABLE 31. Projection of annual salaries in 1979 and 1989 (constant 1966 pesos)

Category	1979	1989	Category	1979	1989
Category 4	13 390	—	Category 1		
Category 3	14 859	—	0-4 years' service	19 318	22 425
Category 2	17 095	19 838	5-9 years' service	23 192	26 910
			10-14 years' service	—	31 395
			15-19 years' service	—	35 880

SOURCE IIEP projection.

On the basis of these average salaries and of the structure of the teaching force previously projected, and including non-salary costs, we arrive at the total recurrent costs for the different population assumptions in table 32.

TABLE 32. Recurrent costs of public first-level education in 1979 and 1989 (thousands of 1966 pesos)

Year	Assumption I	Assumption II	Assumption III
1979	1 881 200	2 017 400	2 029 100
1989	3 354 100	4 037 100	4 380 400

SOURCE IIEP projection.

As in the case of enrolments, the differences in recurrent costs for the three population growth assumptions will remain relatively slight in 1979. They will increase notably in 1989.

CAPITAL COSTS

In the absence of sufficiently precise data on the state of premises and their average useful life, it has been impossible to estimate the capital cost of replacing obsolete classrooms. In the following projections we have therefore confined ourselves to the cost of the new buildings needed for the increased enrolments.

According to the standards laid down by ICCE, the cost of constructing a classroom (in constant 1966 pesos) may be estimated at 32,800 for urban areas and 41,900 for rural areas.[1] These are the costs which we have adopted for future projections given in table 33.

TABLE 33. Capital costs of public first-level education in 1979 and 1989 (in thousands of 1966 pesos)

	Assumption I	Assumption II	Assumption III
1979			
Number of classrooms to be built			
Urban areas	800	1 900	2 030
Rural areas	740	1 520	1 690
TOTAL	1 540	3 420	3 720
Capital expenditure	57 000	126 000	137 500
1989			
Number of classrooms to be built			
Urban areas	2 060	3 260	5 070
Rural areas	560	1 170	2 240
TOTAL	2 620	4 430	7 310
Capital expenditure	90 910	155 600	260 200

SOURCE IIEP projection.

As might expected, capital costs are much more sensitive to the different population assumptions than recurrent costs. The number of classrooms to be built depends in practice on the growth rate of enrolments, which differs widely under the three assumptions.

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[1] Building costs are higher in rural areas than in urban areas because of the higher transportation costs of building materials.

Public teacher-training costs

Teacher-training colleges recruit their students from among first-level certificate-holders. The course lasts six years, the first four being devoted to general education, and only the last two to pedagogical training proper. It is, moreover, possible to enter the fifth class of teacher-training colleges directly after four years of general second-level education. Strictly speaking, therefore, only the cost of the last two years of teacher-training colleges should be treated as teacher-training costs. We have, however, been unable to break down the costs of teacher-training colleges into grades. Any assumption as to the difference in cost between the last two years of teacher training and the first four years would therefore involve an arbitrary element. Furthermore, it is important to compare future cost with present cost. In order to make the comparison significant, we have preferred to treat the whole cost of six years teacher-training college as teacher-training costs.

As in other sectors of second-level education, private education is relatively highly developed in teacher training, though its importance is tending to diminish. The percentage of private enrolments to total enrolments in fact fell from 39.7 per cent in 1963 to 28.8 per cent in 1968. In the following comments we shall assume that public teacher-training enrolments should evolve so as to meet all needs for new public first-level school teachers. On the basis of the needs estimated above and the retention rates at present observed, we have projected teacher-training enrolments in 1979 and 1989 as indicated in table 34.

TABLE 34. Projection of public teacher-training enrolments

	1968	1979	1989
Assumption I	38 600	42 600	45 000
Assumption II	38 600	61 400	66 700
Assumption III	38 600	70 400	101 400

SOURCE IIEP projection.

It is important to note that teacher-training enrolments do not follow the same trend as first-level enrolments, partly because the need for new teachers depends not on total first-level enrolments but on their growth rate and partly because, owing to the length of training, there is a substantial time lag between teacher-training enrolments and the need for new teachers. Thus, teacher-training enrolments in 1979 depend on the need for teachers in the period 1980-85.

With regard to the difference between the three population growth assumptions, it should be noted that with the low assumption the increase in teacher-training enrolments is very slight. On the medium assumption this increase is substantial between 1968 and 1979, but then becomes stabilized. On the high assumption the increase is continuous throughout the period.

At the present time there are state teacher-training colleges and provincial teacher-training colleges. In projecting future costs we have therefore had to use a weighted cost for these colleges. The unit costs of teacher training in Colombia are relatively low compared with costs in other countries. This is partly because teacher-training students do not receive any training allowances. Indirect educational costs, such as scholarships and boarding are also low.

To allow for possible future salary rises, we have assumed that unit costs will increase by 1.5 per cent per annum, a rate corresponding to the annual increase of GDP per working-age population. On this assumption, the total cost of teacher training, in constant 1966 pesos, can be projected for 1979 and 1989 in table 35.

TABLE 35. Recurrent costs of public teacher training (thousands of 1966 pesos)

	Assumption I	Assumption II	Assumption III
1979	110 800	159 600	183 000
1989	135 500	200 800	305 200

SOURCE IIEP projection.

Cost of public first-level education and teacher training compared with gross domestic product

It is now possible to summarize (table 36) the different costs of first-level education and teacher training, so as to compare them with those of 1966, selected as reference year.

If the projected cost for 1979 is compared with that for 1966 it will be found to have more than doubled; in 1989 it will be multiplied by 4 or 5.6 according to the population assumption. This excessively fast growth in educational costs is not due solely to population growth, but also to reasons which we shall analyse below, and particularly the improved retention rate, better teacher qualifications and better pay. It should nevertheless be noted that the incidence of population is relatively strong, since in 1989, the cost is nearly 40 per cent higher under the high assumption than under the low assumption.

Another way of showing the effort required for the development of first-level education is to compare the cost of first-level education and teacher training with gross domestic product (table 37).

In the past, the annual growth rate of gross domestic product at constant prices has been as follows: 1950-54, 5.6 per cent; 1954-58, 3.2 per cent; 1958-62, 5.3 per cent; 1962-67, 4.4 per cent.

TABLE 36. Trend of cost of public first-level education and teacher training (in thousands of 1966 pesos)

	1966	1979			1989		
		Assumption I	Assumption II	Assumption III	Assumption I	Assumption II	Assumption III
Fiirst-level education							
Recurrent costs	758 200	1 881 200	2 017 400	2 029 100	3 354 000	4 037 100	4 380 400
Capital costs	39 100	57 000	126 000	137 500	90 900	155 600	260 200
Teacher training	78 300	110 800	159 600	183 000	135 500	200 800	305 200
TOTAL	875 600	2 049 000	2 303 000	2 349 600	3 580 400	4 393 500	4 945 800
Index	100	234.0	263.0	268.3	408.9	501.8	564.8

SOURCE 1966: Cost calculated from the appropriation accounts of the state, provinces and municipalities. Costs estimated net of transfers received.
1979-89: IIEP projections.

It can be seen that there is a certain fluctuation in the growth rate and no clear trend of future evolution. In our projections in table 37 we have therefore assumed a growth rate of 5 per cent per annum, which represents an average rate for the whole period 1950-67.

TABLE 37. Cost of public first-level education and teacher training compared with gross domestic product (millions of 1966 pesos)

	1966	1979			1989		
		Assumption I	Assumption II	Assumption III	Assumption I	Assumption II	Assumption III
Total cost	876	2 049	2 303	2 350	3 580	4 393	4 945
GDP	73 612	138 800	138 800	138 800	226 100	226 100	226 100
Percentage	1.19	1.48	1.66	1.69	1.58	1.94	2.18

SOURCE Total cost: see table 36.
GDP: *Cuentas Nacionales 1950-67*, op. cit. p. 40.

Compared with other developing countries, the share of expenditure on first-level education and teacher training may seem low. The expenditure given in table 37, however, relates only to public education. If private education were added, the cost would be significantly increased, since private enrolments amount to some 20 per cent of the total.

In the event of low population growth, the share of first-level education and teacher training will increase from 1966 to 1979, but will then become stabilized. In the event of high population growth, this share will increase steadily throughout the period and will have almost doubled in 1989.

TABLE 38. Index of trend of the different variables analysed

	1966	1989		
		Assumption I	Assumption II	Assumption III
Population aged 7	100	162.1	203.6	232.1
Entries	100	124.7	156.6	178.5
Enrolments	100	189.6	233.8	258.2
Teachers	100	210.4	259.5	286.4
Recurrent costs of first-level education	100	442.4	532.5	577.7
Capital costs of first-level education	100	232.5	398.0	665.4
Costs of teacher training	100	173.0	256.4	389.8
Total costs	100	408.9	501.8	564.8

SOURCE IIEP projection.

In order to give some idea of the over-all trend of the different variables analysed above, their behaviour is shown in table 38 (1966 = 100) and in figure 8.

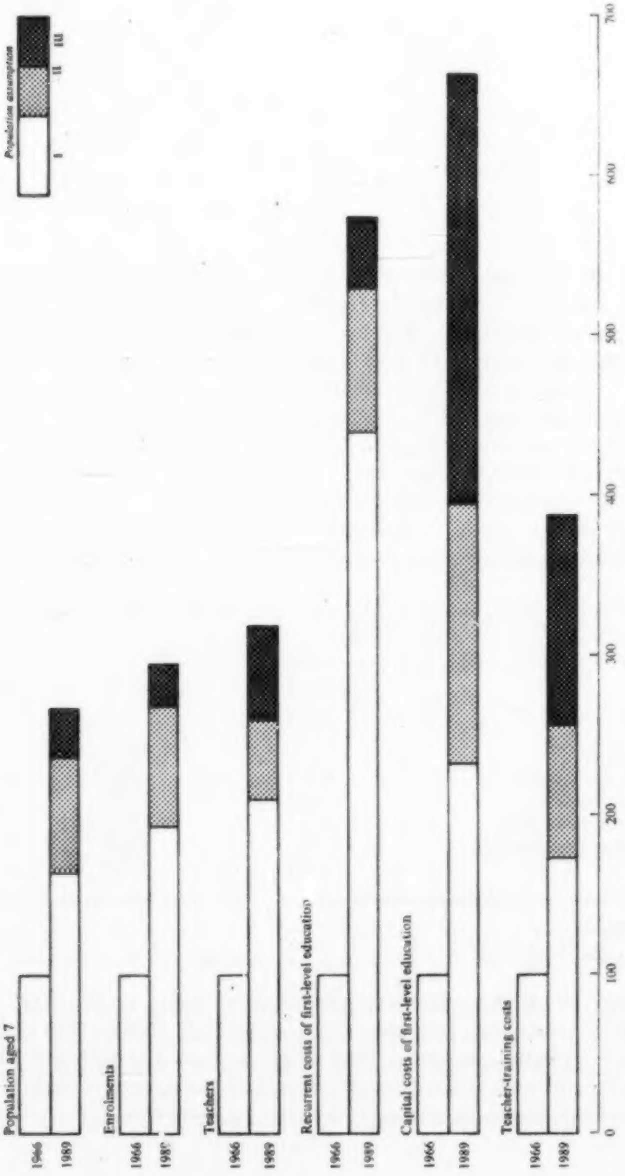

FIGURE 8. *Trend of different variables, 1966-89*

Conclusion

In this study we have tried to show the effects of population growth on the cost of first-level education and teacher training. We have seen that, on the low population growth assumption the cost in 1989 will be four times that of 1966, and, on the high assumption, 5.6 times. This indicates the magnitude of the effort which must be made to develop first-level education. This considerable increase in expenditure is not solely due to the growth of the school-age population. It is also due to higher retention rates, an improved pupil/teacher ratio, better teacher qualifications and higher teachers' pay. It would therefore be valuable to show the relative role of each of the components contributing to the growth of expenditure over the period 1966-89. A simple way of doing this is to calculate the increase coefficient attributable to each of these components as shown in table 39.

TABLE 39. Increase coefficient of the various components of the growth in recurrent costs of public first-level education, 1966-89

	Assumption I	Assumption II	Assumption III
Population growth	1.621	2.036	2.321
Elimination of late entries	0.769	0.769	0.769
Improved retention rate	1.520	1.494	1.447
Improved pupil/teacher ratio	1.109	1.109	1.109
Improved teacher qualifications	1.589	1.548	1.521
Pay increases	1.327	1.327	1.327

SOURCE IIEP projection.

The product of all these increase coefficients is equal to the total increase coefficient of recurrent costs of first-level education from 1966 to 1989 (4.43 in the low population growth assumption, 5.32 in the medium and 5.78 in the high).

Even with the low population assumption, population growth remains the major factor and it clearly increases in magnitude when one goes from the low to the high assumption.

There are, however, other important components, in particular the improvement of teacher qualification [1] and the increase of the retention rates.[2] It will be noted that these two increase coefficients diminish slightly on passing from the low to the high assumption. In the case of teacher qualification, the explanation is that a rapid growth of population, and therefore of enrolments, means increased recruitment of teachers, and therefore a certain ' rejuvenation ' of the teaching force. Since salaries are linked to length of service, this rejuvenation slightly slows down the rise in cost. In the case of retention rates, this is because the improvement is more marked in the top grades than in the bottom grades. A rapid population growth, by widening the base of the pyramid, slightly lessens the overall effect of the improved retention rate. The improvement of retention rates seems to be a necessary condition for achieving universal schooling. As already noted, the problem in Colombia is not simply to increase the intake ratio, since total new admissions in 1968 were already superior to the number of seven-year-old children due to late entries. More importantly, it is essential to reduce drop-outs, which are particularly high in the rural areas for the first and second grades.

Although no precise relation can be established between improved teacher qualification and improved retention rate, it seems that better teacher qualification is one of the conditions for an improved retention rate. In other words, the retention rate is more likely to be improved if an effort is made to improve teacher qualifications.

The fourth factor of importance is pay increases over the period. In the case of Colombia, such pay increases seem to be a condition for improved teacher qualification. At present, a certain number of students from teacher-training colleges prefer not to start on a teaching career because the conditions do not strike them as sufficiently attractive. Improved pay therefore seems essential to attract them into teaching. The improvement of the pupil/teacher ratio will involve only a slight increase in cost.

Finally, it should be noted that only one increase coefficient is less than one, namely, the gradual elimination of late entry, which is the sole factor operating to reduce costs.

---

1. It has been assumed that the proportion of qualified teachers will gradually increase and that in 1989 all the teachers will be qualified.
2. Notably due to the reduction of drop-outs in rural areas.

Appendix

TABLE 1. Forecast trend of rates of promotion, repeating and drop-out in urban and rural areas in public first-level education (in thousands)

Cohort	Grade I-II			Grade II-III			Grade III-IV			Grade IV-V			Grade V
	P	R	D	P	R	D	P	R	D	P	R	D	R
Urban areas													
1963-67	594	225	181	704	191	105	732	165	103	765	126	109	98
1970-74	680	200	120	760	160	80	780	150	70	830	100	70	85
1974-78	750	150	100	800	150	50	850	100	50	870	80	50	75
1979-83	800	125	75	850	100	50	900	75	25	900	75	25	50
1984-88	850	100	50	900	75	25	925	75	0	925	75	0	50
Rural areas													
1963-67	366	300	334	248	250	502	380	165	455	450	120	430	120
1970-74	450	250	300	400	220	380	600	150	250	685	115	200	100
1974-78	620	220	160	710	190	100	750	150	100	800	110	90	95
1979-83	680	200	120	760	160	80	780	150	70	830	100	70	85
1984-88	750	150	100	800	150	50	850	100	50	870	80	50	75

P = Promotion R = Repeating D = Drop-out

SOURCE Cohort 1963-67: Average rates calculated from particulars given in DANE, 'La Educación en Colombia', p. 117, op. cit.
From 1970: IIEP projection.

TABLE 2. Trend of intake in public urban schools given different assumptions of population growth

Year	Ass. I	Ass. II	Ass. III	Year	Ass. I	Ass. II	Ass. III
1970	304 100	304 100	304 100	1981	394 800	456 200	468 000
1971	318 800	318 800	318 800	1982	404 100	472 900	490 300
1972	340 000	340 000	340 000	1983	413 700	490 100	513 700
1973	370 100	371 900	371 900	1984	423 400	508 040	538 100
1974	399 100	408 000	408 000	1985	433 400	526 600	563 900
1975	343 400	358 300	358 300	1986	442 500	542 100	589 700
1976	351 500	373 300	374 500	1987	451 700	558 000	616 600
1977	359 800	389 000	391 400	1988	461 200	574 400	644 700
1978	368 300	405 300	409 100	1989	470 800	591 300	674 000
1979	377 000	422 300	427 600	1990	480 700	608 300	704 900
1980	385 700	440 000	445 300				

Assumption I: low population growth, medium migration
Assumption II: medium population growth, medium migration
Assumption III: high population growth, medium migration

SOURCE IIEP projection.

TABLE 3. Trend of intake in public rural schools given different assumptions of population growth

Year	Ass. I	Ass. II	Ass. III	Year	Ass. I	Ass. II	Ass. III
1970	327 000	327 000	327 000	1981	299 100	345 500	354 500
1971	320 300	320 300	320 300	1982	302 700	354 100	367 200
1972	320 100	320 100	320 100	1983	306 300	362 900	380 300
1973	315 400	317 200	317 200	1984	310 000	371 900	393 900
1974	305 500	312 600	312 600	1985	313 700	381 100	408 100
1975	278 400	290 500	290 500	1986	316 600	387 900	421 900
1976	281 800	299 300	300 200	1987	319 500	394 700	436 100
1977	285 200	306 400	310 300	1988	322 500	401 600	450 800
1978	288 600	317 700	320 700	1989	325 500	408 700	465 900
1979	292 100	327 300	331 400	1990	328 500	415 700	481 700
1980	295 500	337 100	344 100				

For the meaning of the different assumptions, see table 2.

SOURCE IIEP projection.

TABLE 4. Projection of public first-level enrolments given different assumptions of population growth (in thousands)

Population growth	1968	1974	1979	1984	1989
Urban areas					
Assumption I	1 276	1 612	1 759	1 995	2 346
Assumption II		1 623	1 896	2 330	2 894
Assumption III		1 623	1 908	2 415	3 194
Rural areas					
Assumption I	938	1 010	1 272	1 421	1 542
Assumption II		1 018	1 373	1 658	1 902
Assumption III		1 018	1 381	1 721	2 098

For the meaning of the different assumptions, see table 2.

SOURCE IIEP projection.

TABLE 5. Projection of needs for public school teachers

Year	Ass. I	Ass. II	Ass. III	Year	Ass. I	Ass. II	Ass. III
1972	67 090	67 090	67 090	1982	92 520	104 990	107 115
1973	70 373	70 475	70 475	1983	95 010	109 415	112 465
1974	74 910	75 455	75 455	1984	97 600	113 960	118 163
1977	83 720	87 240	87 415	1987	105 641	127 810	137 140
1978	85 585	90 660	91 010	1988	108 390	132 455	144 065
1979	86 600	93 400	93 992	1989	111 090	137 020	151 205

For the meaning of the different assumptions, see table 2.

SOURCE IIEP projection.

TABLE 6. Projection of the number of public school teachers to be recruited

Year	Ass. I	Ass. II	Ass. III	Year	Ass. I	Ass. II	Ass. III
1974	5 127	5 240	5 240	1984	4 780	6 745	7 670
1979	4 861	6 124	6 297	1989	5 378	7 600	9 860

For the meaning of the different assumptions, see table 2.

SOURCE IIEP projection.

Tanzania: a case study

Ta Ngoc Châu and Françoise Caillods

Contents

General information on Tanzania 177

Introduction 179

I. The development of education in Tanzania since independence 181
  The financing of educational expenditures 181
  The development of first-level education 185

II. The impact of demographic growth on the development and cost of education during the next two decades 194
  Projection of enrolment 194
  Projection of teacher supply and demand 200
  Projection of the cost of first-level education and teacher-training colleges . . . 210

Conclusion 220

Appendix 223

EXPLANATORY NOTE

This report has been prepared from materials supplied by the Ministry of Education and from the findings of a research mission in Dar-es-Salaam carried out during February 1970. The Institute is very grateful to the Ministry of National Education and Directorate of Planning and Development for their total co-operation and assistance. Although, traditionally, the work of civil servants should not be acknowledged in public, a special mention should be given to the name of Mr. R. H. Mayagila, Senior Education Officer (Directorate of Planning and Development). He not only actively participated in the preparation of the paper, but the authors were also able to benefit from a former paper he wrote on the same subject. The authors are also indebted to Mr. C. R. Carter, Ford Foundation, Educational Planning Adviser, and Mr. J. Kinunda, Assistant Director (Directorate of Planning and Development) for their help and advice.

General information on Tanzania

GEOGRAPHICAL LOCATION

Tanzania is situated in East Africa along the Indian Ocean, bordered in the north by Mount Kilimanjaro and Lake Victoria, in the west by Lake Tanganyika and in the south by Lake Nyasa. The country covers an area of 362,000 square miles (including Zanzibar and the Pemba Islands).

POPULATION

The population is estimated at 13 million in 1970; the annual rate of growth of population has averaged 2.7 per cent. Most of the population live in the rainy part of the country: less than 5 per cent is urbanised.

Africans represent 99 per cent of the mainland population. The non-African community, however, (Indo-Pakistanis, Arabs and Europeans) has considerable economic importance.

There are two official languages, Kiswahili and English. English is the primary language of commerce, law and higher education.

GROSS DOMESTIC PRODUCT

The principal cashcrops of Tanzania are coffee, cotton, sisal, cashew-nuts, tea and sugar. In the tropical coastal areas crops such as cocoa, coconuts and bananas are produced. In the highlands maize and wheat are cultivated, mainly for internal consumption. Livestock rearing plays an important role at the subsistence level.

Diamonds, gold, tin, lime and salt are the most important minerals but petroleum products from imported oil have become major export items. The distribution of gross domestic product (GDP) at factor cost by industry in 1968 is shown in table 1. (U.S. $1 = 7.14 shillings, 1969.)

Because of the relative inaccuracy of the estimates of GDP prior to 1966, it is difficult to assess the real growth rate in the past. From 1966 to 1968, according to figures recently published, the annual rate of growth in constant prices was

TABLE 1. Gross domestic product at factor cost, 1968 (millions of shillings)

Industry	Amount	Percentage
Agriculture	2 973	40.2
Mining	134	1.8
Manufacturing	519	7.0
Electricity	69	0.9
Construction	331	4.5
Commerce	966	13.1
Transport	677	9.1
Finance, insurance and business services	710	9.6
Public administration and other services	1 019	13.8
TOTAL	7 398	100.0

5.5 per cent. In 1968 GDP *per capita* was about 600 shillings (i.e., U.S.$ 84 according to 1969 exchange rates).

Structure of the educational system

First-level education in Tanzania lasts for seven years — four years in lower stage first-level and three years in upper stage first-level schools. Each grade is known as a standard beginning with standard I. Education at standards I and II is on a half-day basis.

At the end of standard IV there is a selective examination for entry into standard V, but this is being phased out. After standard VII there is another selective examination which determines those who will go on to general second-level schools, technical schools and lower level teaching-training colleges.

After four years of general second-level education students sit for the Cambridge school certificate. Those who are successful can either proceed to higher stage second-level education (two years leading to the higher school certificate examination), to third-level technical or commercial education (three years) or to third-level teacher-training colleges.

Third-level education is also provided at the University of Dar-es-Salaam.

Introduction

The aim of this study is to show the impact of demographic growth on the development and cost of education in Tanzania. For obvious reasons the major effect of the growth of population is felt in first-level education. This is particularly true in Tanzania for three main reasons.

Firstly, the present objective of the Tanzanian government is to increase the intake ratio of first-level education, i.e. the proportion of 7-year-old children who are admitted to school, from around 45 per cent in 1968 to 95 per cent in 1989. The 95 per cent target is explained by the fact that it will be very difficult to develop first-level education in the more remote parts of the country.

Universal first-level education will be complete in 1996 when full admission will have been given to seven successive cohorts of 7-year-old children corresponding to the seven standards of first-level education. The length of time allowed for the implementation of the target is rather long. This is because Tanzania has chosen to provide complete seven years' first-level education for every child, while in some other developing countries universal first-level education is implemented in two phases, for example, it may be limited to four years for a period of time.

As the Tanzanian enrolment target is set not in terms of numbers of pupils to be enrolled but in terms of the proportion of children of a given age to be admitted to first-level schools, clearly the effort required for the achievement of the target will depend largely on the future growth of the number of 7-year-old children.

Secondly, the official policy of the Tanzanian government is to develop second- and third-level education in relation to manpower requirements. As a result of this policy, the number of first-level school leavers to gain access to second-level education will decrease; from 41 per cent in 1961 to 12.6 per cent in 1970 and to only 5.2 per cent in 1979. There is no direct relationship, therefore, between the development of first-level education and enrolments in second- and third-level education as first-level education will be largely terminal.

Thirdly, current expenditures on first-level education and first-level teacher-training account for a large share—about two-thirds in the recent past—of total educational expenditures. Bearing in mind the rather high target set for first-level education, one may assume that this proportion will be maintained or increased during the next two decades.

A further relevant consideration is that as the official second-level school entry age is 14, and that of third-level education 20, any change in the fertility rate during the 1970s will only begin to make its effect felt on second-level education in the mid-1980s and on third-level education in the 1990s. To assess the effect of demographic growth on these two levels of education, one therefore has to make very long-term projections and run the risk of using assumptions of doubtful validity.

Thus, in order to show the impact of population growth on educational expenditures, we will try to assess the effect of various population trends on the development of first-level education and teacher training.

It is perhaps convenient to summarize at the outset the main conclusions of the study.

Making moderate assumptions about population growth, pupil/teacher ratios and teachers' salaries, the total cost of first-level education and teacher training will increase from 141,795,000 shillings in 1967 to 1,162,797,000 shillings in 1989. This means that total costs would increase more than eight times during a twenty-two year period, a compound increase of about ten per cent per annum.

The effect of demographic growth is found to be important; alone it would lead to almost doubling present expenditures in the twenty-two year period. It is, however, the proposed increase in the intake ratio and in retention rates which will play the greatest part in the increase in total costs.

This study is divided into two parts. In part I developments in the recent past and what is projected in the current plan, 1969-74, are examined. In part II we will look at the cost of achieving the 1989 target, taking into account population growth, the policy concerning the level of qualification of the teaching force and its effect on teachers' salaries, and the level of other teaching costs.

I The development of education in Tanzania since independence

Since independence in 1961 Tanzania has had three successive development plans, the first one covering the period 1961-63, the second 1964-69, and the current one which covers the period 1969-74. By analysing what has already been achieved and what is planned for the near future, we will try to assess the effort made by the Tanzanian government in developing education.

The financing of educational expenditures

Gross national product figures published up to 1969 were based on a national accounts system adopted in the early 1960s. This system contained, however, several imperfections, especially in its coverage of the subsistence sector. The methodology used, dictated by the availability of data, was also rather crude. A major revision and improvement of the national accounts was undertaken in 1968-69, and in 1970 a new series was published, but it covered only the period 1966-68. Both series of GDP at factor cost are given in table 2.

TABLE 2. Gross domestic product at current factor cost (millions of shillings)

	Monetary G.D.P.			Total G.D.P.		
	Earlier series	New series	Difference (percentage)	Earlier series	New series	Difference (percentage)
1961	2 756			3 870		
1962	2 976			4 189		
1963	3 342			4 547		
1964	3 801			4 837		
1965	3 948			4 894		
1966	4 418	4 530	2.5	5 462	6 592	20.7
1967	4 625	4 771	3.1	5 650	6 883	21.8
1968	4 828	5 174	7.2	5 869	7 398	26.0

SOURCE Earlier series: The United Republic of Tanzania, *Background to the budget. An economic survey 1968-69*, Dar-es-Salaam, 1968, p. 9;
New series: Bureau of Statistics, *National account of Tanzania 1966-68*, Dar-es-Salaam, p. 10.

When these two series are compared, it can be seen that the earlier estimates of total GDP were substantially lower than the new ones and that the gap tended to increase from 1966 to 1968. Both the absolute level of total GDP and its growth from 1966 to 1968 were therefore underestimated by the earlier series.

The difference, however, is not very large for the monetary sector and the underestimation of total GDP is mainly explained by the subsistence sector. Because of the relative inaccuracy of the earlier series and because of the too short period covered by the new one, it is very difficult to assess what has been the actual rate of growth in the past. It is likely that it was around 5 per cent in constant prices.

Government revenues, however, have tended to increase at a faster rate. It would not be very significant to compare government revenues with total GDP since the non-monetary sector was largely underestimated. We have therefore preferred to use the monetary GDP which is more accurate and which has a closer relationship with government revenues.

Government revenues, as a percentage of monetary GDP, have increased gradually from 15.9 per cent in 1961-62 to 20.4 per cent in 1968-69. It seems, however, that this trend will not be maintained in the futu[illegible]cording to the current plan, the rate of increase of government revenues will only be slightly higher than that of monetary GDP.

Total recurrent educational expenditures have more or less followed the same trends as government revenues (from 3.7 per cent of monetary GDP in 1963 to 4.31 per cent in 1968), as shown in table 3.

Distribution of educational expenditures by financing sources

The four main sources of finance for recurrent educational expenditures are the central government, the local authorities, parents (in the form of fees) and external aid. To these one should also add the contributions of voluntary agencies, but these are excluded as the figures are not known with any degree of accuracy. Thus, with the above proviso, the distribution among the various financing sources is as shown in table 4.

The main burden of financing recurrent educational expenditures rests upon the central government. Total recurrent government expenditures, including expenditures on consolidated funds (mainly debt servicing), have increased from 479,000,000 shillings in 1962-63 to 1,470,251,500 shillings in 1969-70. Excluding expenditure on debt servicing, government expenditures on education have, in spite of some fluctuations, accounted on average for 20 per cent of total government expenditures on supply. But, as mentioned earlier, from 1962 to 1968 government revenues and expenditures increased at a faster rate than monetary GDP.

Insofar as the local authorities are concerned, it is not possible to draw any conclusions as the period under review is too short. It seems, however, that the share of local authorities, which increased notably between 1963 and 1965, has levelled off. In fact, from 1966 to 1968 their share decreased in both relative and absolute terms.

TABLE 3. Government revenues and monetary GDP (revenue in thousands, GDP in millions of current shillings)

	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69
Direct taxation	119 450	123 300	140 678	152 101	183 493	232 837	264 023	296 500
Indirect taxation	236 254	291 240	311 552	405 628	418 362	510 893	583 872	658 920
Other revenues	82 004	86 012	112 937	118 861	114 387	124 086	145 130	99 864
TOTAL	437 708	500 552	565 167	676 590	716 242	867 816	993 025	1 055 284
Monetary GDP [1]	2 756	2 976	3 342	3 801	3 948	4 530	4 771	5 174
Government revenues as a percentage of monetary GDP	15.9	16.8	16.9	17.8	18.1	19.2	20.8	20.4

[1] Monetary GDP corresponds to calendar year. From 1961 to 1965 the data are from the earlier series. Those of 1966 to 1968 are from the new one.

SOURCE: Government revenue 1961-68 Appropriation accounts
1968-69 Estimates
Monetary GDP (see table 2)

TABLE 4. Educational recurrent expenditures by financing sources, 1963-67 (thousands of shillings)

	1963		1965		1966		1967		1968	
	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage
Government	89 820	70.2	112 007	67.8	133 390	71.2	169 874	76.8	189 207	84.7
Local authorities	25 260	19.8	38 999	23.6	41 701	22.1	33 060	14.9	18 433	8.3
Fees	8 520	8.8	11 166	6.8	11 403	6.2	14 254	6.4	13 134	5.9
Grant from foreign sources [1]	—	—	1 900 [2]	1.1	—	—	3 059 [3]	1.4	270	0.1
Others	1 540	1.2	1 223	0.7	856	0.5	1 198	0.5	2 212	1.0
TOTAL	125 140	100.0	165 295	100.0	187 380	100.0	221 445	100.0	223 256	100.0

1. Due to lack of accurate information, the contribution of foreign countries to the payment of expatriate teachers has not been included.
2. Contribution of U.S. Peace Corps (1,730,771 shillings) and Ford Foundation grant (169,711 shillings)
3. Unesco contribution.

SOURCE The United Republic of Tanzania, *Annual report of the Ministry of National Education*, Dar-es-Salaam, 1963-68

Although foreign aid contributes to some extent to the financing of recurrent educational expenditures, it is difficult to assess its share accurately. The figures given in table 4 relate only to grants which are given from time to time to various levels of education and which can be identified. One should also take into consideration the gratuities and ' overseas additions ' which are paid, in most cases, to expatriate teachers by their sponsoring governments. In addition, some countries choose to supply teachers ' in kind '.

Finally, one should mention fees which play a significant role in the financing of first-level education.

Distribution of recurrent expenditures among the various levels of education

First-level education and teacher training have accounted for a large share of recurrent educational expenditures (see table 5). However, from 1963 to 1967 the proportion declined somewhat from 66.2 per cent to 59 per cent due to the high priority accorded to second-level and third-level technical education during this period. This trend is now being reversed because of the target for universal admission to first-level education beginning in 1989.

The share of second-level and technical education will decline in the future for two main reasons: the pegging of second-level and technical enrolments to manpower needs and the gradual replacement of expatriate teachers by Tanzanians, which will lead to a certain reduction in costs.[1]

This policy of localization implies a rapid expansion of the University of Dar-es-Salaam and an increased number of scholarships for Tanzanians to study abroad. The share of third-level education in 1973/74 will be double that in 1963, namely 13.8 per cent as compared with 6.3 per cent.

The development of first-level education

Official policy concerning the development of first-level education has varied somewhat in the past. These changes will be analysed in terms of their effects on the increase in enrolments, on the supply and demand for teachers of various qualifications and on the cost and financing of first-level education.

Policy concerning the development of first-level education

THE STRUCTURE AND QUANTITATIVE EXPANSION OF FIRST-LEVEL EDUCATION

Prior to independence in 1961 there were separate educational systems for Europeans, Asians, other non-Africans and Africans. In all systems first-level educa-

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[1] The reduction in cost is due to the fact that new Tanzanian teachers begin at the bottom of the scale, while the expatriate teachers they replace have a longer length of service.

TABLE 5. Recurrent expenditures of the various levels of education (excluding expenditures of voluntary agencies from their own sources and expenditures of non-aided schools (thousands of shillings)

Year	General administration		First level		Teacher training		Second level and technical		Third level		Total
	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage	
1963	7 850	6.3	75 900	60.6	6 980	5.6	26 560	21.2	7 850	6.3	125 140
1965	10 075	6.1	99 054	60.0	8 111	4.9	36 370	22.0	11 685	7.0	165 295
1966	10 338	5.6	107 805	57.5	12 494	6.7	41 847	22.3	14 866	7.9	187 350
1967	10 916	4.9	119 272	54.0	12 901	5.8	53 217	24.0	25 139	11.3	221 445
1968	12 862	5.8	120 438	53.9	11 468	5.2	56 992	25.5	21 493	9.6	223 253
Plan projection											
1969/70	12 925	5.0	141 600	54.8	14 470	5.6	55 406	21.4	34 094	13.2	258 495
1970/71	13 979	5.0	153 645	55.0	15 964	5.7	57 440	20.5	38 559	13.8	279 587
1971/72	14 996	5.0	166 843	55.6	16 909	5.6	59 574	19.9	41 594	13.9	299 916
1972/73	16 104	5.0	180 634	56.1	18 125	5.6	62 516	19.4	44 702	13.9	322 081
1973/74	17 292	5.0	195 831	56.7	19 431	5.6	65 442	18.9	47 850	13.8	345 846

SOURCE 1963-68: *Annual Report of the Ministry of National Education*, op.cit.
1969-74: The United Republic of Tanzania, *Tanzania second five-year plan*, Vol. I, Dar-es-Salaam, 1969 (Expenditures for general administration and technical education were not estimated in the plan. These data were communicated directly by the educational planning office).

tion lasted for eight years, four years of lower stage and four years of higher stage first level, which led to a first-level school leaving certificate.[1] Attendance for standards I and II was on a half-day basis, but in many schools this was also true for standards III and IV. At the end of standard IV there was a selective examination, and only a small proportion of children, about twenty per cent, entered higher stage first level.

After independence all systems were integrated into a national system. No major changes, however, were made in the structure of the system. The main concern at that time was the acute shortage of qualified manpower, hence the Three-year Plan, 1961-63, aimed at ' a considerable development of secondary and post-secondary education,' and first-level education was given a low priority.

During the First Five-year Plan, 1964-69, the main objective continued to be meeting high-level manpower requirements, and the quantitative expansion of first-level education was not encouraged. However, a major reform of the structure of first-level education was embarked upon. As most children left school at the end of standard IV because of the selective examination for entry to standard V, it was decided gradually to abolish half-day attendance for standards III and IV. This has now been largely achieved. In addition, to adapt the system to the needs of the majority of children leaving school at the end of standard IV, the curriculum of lower stage first-level education was re-designed.

In view of these changes in lower first-level education it was felt that higher stage first-level education could be reduced to three years. The process of suppressing standard VIII was gradually begun, and the conversion of the eight-year system to a seven-year system became effective in 1969.

First-level education was accorded much higher priority in the Second Five-year Plan, 1969-74. Firstly, it was decided to increase the intake ratio of 7-year-old children from the current level of 45 per cent to 95 per cent in 1989. The second decision, the effect of which will be almost as important in terms of the growth of total enrolments in first-level education, was to increase rapidly the transition ratio between standards IV and V, so that the selective examination between these two standards may be suppressed at the end of the plan period.

Looking at the period since 1961 as a whole (see table 6), one sees that although a low priority was given to the quantitative expansion of first-level education during most of the period, admissions to standard I increased steadily from 121,386 in 1961 to 157,196 in 1967, an annual rate of growth of 4.4 per cent. This rate of growth was slightly higher than that of the 7-year-old children in the population and the intake ratio rose from 40 to 45 per cent. With the implementation of the current plan the intake ratio will again increase rapidly and is expected to reach 52 per cent in 1973/74.

The rate of growth of enrolments in standard V was even faster, averaging 20 per cent during the period. It was due to an increase in the transition rate between standards IV and V from 22.5 per cent in 1961 to 48.2 per cent in 1967.

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[1] The first-level school leaving certificate did not give direct access to second-level education—as at present. Access was through a selective examination.

TABLE 6. Enrolment in first-level schools, past and projected

Year	Standard I	Standard V	Total enrolment
1961	121 386	19 721	486 470
1962	125 521	26 803	518 663
1963	136 496	40 503	592 104
1964	140 341	43 610	633 678
1965	149 314	53 483	710 200
1966	154 512	60 721	740 991
1967	157 196	60 956	753 114
1968	155 802	67 417	765 169
Plan projection			
1970	171 500	82 200	850 900
1971	180 000	98 900	906 600
1972	189 000	113 200	977 800
1973	198 400	127 800	1 056 700
1974	208 300	147 300	1 140 100

SOURCE *Annual report of the Ministry of National Education*, 1968, op. cit., table A26
Tanzania second five-year plan, Vol. II, op. cit., p. 63.

THE POLICY ON TEACHERS' QUALIFICATIONS AND ITS EFFECTS ON TEACHER SUPPLY

In 1961 there were three categories of first-level school teachers — grades A, B and C. Training for each category lasted for two years, but they were recruited at different levels of education. Entry to grade A teacher-training colleges was after four years of second-level education, grade B after two years and grade C after completion of first-level education.

The reason for having three types of teachers was partly that teaching in standards I to V was in Kiswahili, with English language teaching optional in standard VI and compulsory in standards VII and VIII. Grade C teachers were trained to teach in Kiswahili, while grade B, and more particularly grade A, were trained in English. Thus, in principle, standards I to V were staffed with grade C, standard VI with grade B and standards VII and VIII with grade A. In a complete eight-standard first-level school, therefore, the theoretical staffing formula was five grade C teachers, one grade B and two grade A.

In practice the staffing formula was not applied in all first-level schools. In 1964, for example, the situation was as shown in table 7.

As can be seen from this table, in urban areas the number of teachers in post was slightly higher than the number of teachers required. In addition, there was apparently a surplus of 233 English-language teachers (97 A's and 136 B's). In rural areas, on the other hand, there was a shortage of 867 teachers, in particular of English-language teachers. It was not possible, however, to transfer the urban surplus of English-language teachers to rural areas as nearly all of them were of

TABLE 7. Teachers required and teachers in post in first-level education, 1964

	Grade A	Grade B	Grade C	Total
Urban schools				
Total teachers required	208	134	761	1 103
Actual teachers in post	305	270	591	1 166
Rural schools				
Total teachers required	1 425	981	9 339	11 745
Actual teachers in post	390	1 109	9 379	10 878

SOURCE A.C. Mwingira and S. Pratt, 'The process of educational planning in Tanzania' in *Educational development in Africa*, Vol. I, Paris, Unesco: IIEP, 1969, p. 172.

Indian origin and it was unlikely that they would settle in rural areas, or make satisfactory teachers for children from a different linguistic background.

The First Five-year Plan provided for an increase in the number of grade A teachers to be trained, with a decrease in grade C training. Grade B became an upgrading category for in-service promotion of grade C teachers. These decisions naturally resulted in an improvement in the teacher qualification profile.

The Second Five-year Plan, with its emphasis on the quantitative expansion of first-level education entailed revising plans for teacher training. In order to meet the requirements for teachers in lower stage first-level education, the provision of grade C teachers will be very much increased [1] (indeed quintupled), whereas in the previous plan the trend had been toward the abolition of this category.

The training of grade A teachers will also be expanded toward the end of the plan in order to meet the demand for teachers for upper stage first-level.

The effect of these policy changes can be seen in the intake figures for teacher-training courses shown in table 8.

The costs and financing of first-level education

Expenditures on first-level education rose steadily from 88,160,000 shillings in 1963 to 124,818,000 shillings in 1968. Most of the increase can be attributed to the growth of enrolments, but there was some increase in unit costs (table 9).

Teachers' salaries have gradually increased from 65 per cent to 76 per cent of total recurrent expenditures, while boarding school expenditures, conversely, have tended to decrease. In the future, with the expansion of first-level education and the gradual suppression of the entrance examination to standard V (which

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[1] The plan made provision for the training of a new category of teachers—grade D teachers who would only receive one year of professional training after completion of first-level education and national service. It was recently decided that this category would not in fact be created. We have thus assumed that the number of grade D teachers to be trained will be replaced by an equivalent number of grade C teachers.

TABLE 8. Intake into teacher-training courses

Year	Grade A	Grade B	Grade C
1961	92	129	780
1962	86	103	753
1963	183	50	700
1964	289	—	891
1965	493	—	625
1966	703	—	643
1967	818	—	359
1968	1 056	—	150
Plan projection			
1969	1 200	—	240
1970	740	—	1 400
1971	740	—	1 700
1972	740	—	1 900
1973	1 000	—	1 850
1974	1 000	—	1 750

SOURCE *Annual report of the Ministry of National Education*, op. cit. 1966, pp. 76-77
Tanzania second five-year plan, op. cit. Vol. I, p. 153. (For details about grade C teachers see footnote 1, p. 189).

implies that the typical first-level school will have seven standards), the relative share of boarding school expenditures will decrease even further.

On average, unit costs rose by 2 per cent per annum. This increase was mainly due to the improvement in the teacher qualification profile, and consequently, to the increase in the teachers' salary costs.

First-level education expenditures are financed by three main sources: the central government, the local authorities, and parents (see table 10).

The share borne by the local authorities increased up to 1965 (to more than 40 per cent if one excludes the contributions of voluntary agencies and miscellaneous sources). Since then, however, it had tended to decrease, not only in relative terms, but also in absolute terms. The decline in the relative part played by the local authorities is due to the fact that their resources have not grown as quickly as their total expenditures.

In view of this widening resource gap, the government has asked the local councils to revise their assessment rolls in the light of the 1967 population census which indicated that there would be an overall shortfall of about 20 per cent, and to introduce a more progressive scale of local rates.

But such measures could not be effective in the short term and, in fact, many local authorities have already run into difficulties. In mid-1968 the President intervened and announced that the central government would take over responsibility for the payment of salaries to all teachers, thus relieving the local authorities of much of their financial responsibility regarding education. As a result of this increased responsibility, the government has made provision in the present plan

TABLE 9. Expenditure and cost of first-level education

	1963		1965		1966		1967		1968	
	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage
Expenditures (thousands of shillings)										
Teachers' salaries	57 640	65.4	69 260	69.0	78 254	68.0	88 322	69.6	95 405	76.4
Boarding	15 490	17.6	11 976	11.9	14 123	12.3	15 543	12.2	10 803	8.7
Others	15 030	17.0	19 147	19.1	22 728	19.7	22 988	18.2	18 610	14.9
TOTAL	88 160	100.0	100 383	100.0	115 105	100.0	126 855	100.0	124 818	100.0
Enrolment	592 104		710 200		740 991		753 114		765 169	
Unit costs (shillings)										
Teachers' cost	98		98		105		117		125	
Boarding cost [1]	26		17		19		20		14	
Other costs	25		27		31		30		24	
TOTAL	149		142		155		167		163	

[1] This is the boarding cost per enrolled pupil and *not* per boarder.

SOURCE *Annual report of the Ministry of National Education*, 1963-68, op. cit.

TABLE 10. First-level education recurrent expenditures by financing sources (thousands of shillings)

	1963		1965		1966		1967		1968	
	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage	Amount	Percentage
Government	44 860	59.1	48 247	50.0	55 916	52.2	72 806	61.5	89 905	75.2
Local authorities	25 260	33.3	38 999	40.5	41 700	38.9	33 060	27.9	18 433	15.4
Fees	5 760	7.6	9 148	9.5	9 591	8.9	12 567	10.6	11 220	9.4
Sub total	75 880	100.0	96 394	100.0	107 207	100.0	118 433	100.0	119 558	100.0
Voluntary agencies	12 270		1 329		7 300		7 581		4 380	
Others	10		2 660 [1]		598		839		880	
TOTAL	88 160		100 383		115 105		126 853		124 818	

[1] Including 1,667,101 shillings from Peace Corps.

SOURCE: *Annual report of the Ministry of National Education*, 1963-1968, op. cit.

for both a ' super-normal ' rate of growth of its own recurrent expenditures on education (9 per cent per annum compared to an anticipated growth of availability of resources to the government of 7.5 per cent) and for a much higher rate of growth of recurrent expenditures on first-level education than was allowed for in previous plans.

Although fees for second-level education were abolished in 1964, they still play a significant role in the financing of first-level education. Boarding and day school fees accounted for more than 10 per cent of total recurrent expenditures of first-level education.

II The impact of demographic growth on the development and cost of education during the next two decades

It is the intention of the government of Tanzania to increase gradually the first-level school intake ratio from the level of 45 per cent in 1969 to 95 per cent in 1989. The effort required for the attainment of this target will depend on the rate of growth of the school-age population, the policy concerning the qualification profile of the teaching force, the behaviour of teachers' salaries, the level of non-salary costs, and the cost of teacher training. The feasibility, from a financial point of view, will furthermore depend on the growth rate of the economy.

In order to illustrate the various consequences implied by the attainment of the 1989 target, we will project enrolment in first-level education according to various population trends. We will then project the supply and demand of teachers according to various assumptions about the teacher qualification profile: and we will finally estimate the cost of the development of first-level education and teacher training according to these different hypotheses.

Projection of enrolment

As the target is set in terms of an intake ratio, we have first to project new admissions to first-level education. These new admissions will, of course, depend on the growth of the school-age population in the future.

Demographic projection

In 1967 a population census was taken in Tanzania and the total population was found to be 11,957,000 in mainland Tanzania. Compared with the results of the previous census (which took place in 1957) it showed an unexpectedly high increase in population and it is very likely that the size of the population was underestimated by the 1957 census.

Because of lack of appropriate data it was not possible to estimate directly the specific age fertility rate and the specific age mortality rate. However, by analysing the results of the 1967 census, the census office of the Central Statistical Bureau has calculated the following estimates concerning the population characteristics of Tanzania:[1] crude birth rate, 47 per thousand; crude death rate, 22 per thousand; life expectancy at birth, 40 years; infant mortality, 165 per thousand; gross reproduction rate, 3.20.

Using these population data, the Population Division of the United Nations prepared three population projections on the basis of the following assumptions regarding the evolution of fertility and mortality rates in the future.

FERTILITY ASSUMPTION

It is assumed that the present high level of the gross reproduction rate (3.20) will continue in the future with the distribution of the fertility pattern as given in table 11.

TABLE 11. Distribution of the fertility pattern

Age	Percentage	Age	Percentage
15-19	8.9	35-39	14.7
20-24	23.7	40-44	6.5
25-29	24.4	45-49	1.9
30-34	19.9		100

MORTALITY ASSUMPTIONS

Three mortality assumptions were made which would cause life expectancy at birth to evolve as shown in table 12.

TABLE 12. Life expectancy at birth

	High		Mean		Low	
	Male	Female	Male	Female	Male	Female
1965-70	41.40	44.60	40.15	43.35	38.90	42.10
1970-75	45.16	48.36	42.65	45.85	40.15	43.35
1975-80	48.90	52.10	45.15	48.35	41.40	44.60
1980-85	52.85	55.85	47.65	50.85	42.65	45.85

SOURCE UN Population Division, unpublished working paper.

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[1] See B. Egero, *Population characteristics of Tanzania: recent estimates*, Central Statistical Bureau, Dar-es-Salaam, 1969.

TABLE 13. Population projection 1965-85

	1965	1970	1975	1980	1985
Assumption I					
School-age population (5-9)	1 665	1 886	2 109	2 434	2 811
School-age population (10-14)	1 409	1 595	1 810	2 030	2 347
Working-age population (15-60)	5 972	6 762	7 675	8 730	9 919
Total population	11 674	13 171	14 945	17 038	19 496
Assumption II					
School-age population (5-9)	1 665	1 898	2 162	2 541	2 992
School-age population (10-14)	1 409	1 598	1 830	2 093	2 470
Working-age population (15-60)	5 972	6 778	7 724	8 842	10 153
Total population	11 674	13 236	15 150	17 475	20 287
Assumption III					
School-age population (5-9)	1 665	1 910	2 214	2 647	3 166
School-age population (10-14)	1 409	1 602	1 849	2 157	2 593
Working-age population (15-60)	5 972	6 793	7 769	8 947	10 378
Total population	11 674	13 299	15 347	17 893	21 039

Assumption I: low population growth
Assumption II: medium population growth
Assumption III: high population growth

SOURCE United Nations Population Division, unpublished working paper.

As these three projections assume the same fertility level and a declining mortality rate (although at different rates) the difference between them is not very large. (See table 13.)[1]

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[1] A different set of projections was prepared in 1971 by R. Henin at the University of Dar-es-Salaam using two assumptions about fertility (constant fertility and rising fertility) and only one assumption of decreasing mortality. They are, however, only projected until 1980.

	High assumption		Low assumption	
Year	Birth rate per thousand	Death rate per thousand	Birth rate per thousand	Death rate per thousand
1967-70	48	22	48	22
1970-75	49	20	48	20
1975-80	50	18	48	18

In the previous projections, the rate of growth of total population is rather high (about 3 per cent per annum). But, as the decline in the mortality rate is higher for younger generations than for older ones, the rate of growth of school-age population is higher than that of the working-age population (except for the low assumption and for the period 1965-75). Furthermore, as shown in table 14, the range of growth rates in the various assumptions is larger for the school-age population (from 2.46 per cent to 3.55 per cent) than for the working-age population (from 2.54 per cent to 2.94 per cent).

TABLE 14. Population growth rates

		School-age population percentage	Working-age population percentage
Assumption I	1965-75	2.46	2.54
	1975-85	2.79	2.61
Assumption II	1965-75	2.65	2.62
	1975-85	3.19	2.78
Assumption III	1965-75	2.83	2.67
	1975-85	3.55	2.94

SOURCE United Nations Population Division, unpublished working paper.

Projection of admission to first-level education

The official age of admission to first-level education is seven. This age has been chosen so that first-level school-leavers (after seven years of studies) may directly enter the labour market if they so wish. Access to second-level education is, in any case, limited to a small proportion of those who finish first-level education.

In reality, however, the age range of the children who are admitted to first-level education is very wide, ranging from 6 to 14. Precise statistical data about the age distribution of children newly admitted to first-level education are not available. Early entry and late entry do not affect total admission in the same way. In the long run, early entries do not increase total admission (because those who are admitted at the age of 6 will not be counted as new admissions at the age of 7). Late entries, conversely, can temporarily increase total admission. The reasons for late entry are various but one of the most important is undoubtedly the recent development of first-level education in some areas. With the gradual development of first-level education throughout the country, the problem of late entry will certainly become less severe. Thus, we have assumed that in the long run, total admissions will depend on the size of the 7-year-old population.

In order to reach the 1989 target, the intake ratios are planned to increase in the following way: 50 per cent in 1974, 60 per cent in 1979, 77 per cent in 1984 and finally, 95 per cent in 1989. Taking into account these intake ratios and the

TABLE 15. Projection of new admissions to first-level education

Year	Intake ratio	New admissions		
		Assumption I	Assumption II	Assumption III
1968	43.4	155 802	155 802	155 802
1969	44.5	163 356	163 356	163 356
1970	45.3	171 485	171 485	171 485
1971	46.3	180 026	180 026	180 026
1972	47.4	189 000	189 000	189 000
1973	48.5	198 430	198 430	198 430
1974	49.6	208 340	208 340	208 340
1975	52.0	218 400	224 100	229 300
1976	54.0	233 400	240 400	246 900
1977	56.0	249 100	257 400	265 400
1978	58.0	265 500	275 300	285 000
1979	60.0	282 700	294 100	305 600
1980	63.4	290 400	320 800	334 800
1981	66.8	333 600	349 400	365 600
1982	70.2	360 900	379 500	394 800
1983	73.6	389 600	411 300	432 800
1984	77.0	419 600	444 800	469 400
1985	80.6	452 200	481 200	509 400
1986	84.2	486 300	519 600	551 700
1987	87.8	522 100	560 000	596 500
1988	91.4	559 600	602 500	643 700
1989	95.0	598 800	647 200	693 700

SOURCE 1968-69: actual admissions
1970-74: second five-year plan projection
1975-89: IIEP projection based on the intake ratios given as targets by the Ministry of National Education.

three projections of 7-year-old population, new admissions to first-level schools may be projected as shown in table 15.

Projection of total enrolment in first-level education

With the suppression of the selective examination, the evolution of the transition rate between standard IV and standard V is likely to be as follows:

1969	54.5 per cent;
1970	65.7 per cent;
1971	73.7 per cent;
1972	81.6 per cent;
1973	89.7 per cent;
1974	97.5 per cent.

This will change the retention rates in first-level education considerably. The real and the predicted behaviour of the various cohorts entering first-level school from 1964 to 1971 is shown in table 16.

TABLE 16. Behaviour of the various cohorts admitted to first-level education, 1969-71

	Standard						
Year *t*	I *t* + 0	II *t* + 1	III *t* + 2	IV *t* + 3	V *t* + 4	VI *t* + 5	VII *t* + 6
1964	1 000	981	962	947	480	*454*	443
1965	1 000	976	944	914	*463*	452	441
1966	1 000	950	937	*924*	503	490	510
1967	1 000	986	*972*	958	629	614	599
1968	1 000	*986*	972	958	706	689	673
1969	*1 000*	986	972	958	782	763	745
1970	1 000	986	972	958	860	839	819
1971	1 000	986	972	958	935	912	890

SOURCE Calculated on the basis of data supplied by the educational planning office. The figures in italic and those in the upper left hand of the table are based on actual behaviour, while the others are based on the predicted behaviour of the cohorts.

As the drop-out rates envisaged for the cohorts entering first-level education in 1971 are already very low (compared with those in other developing countries) we will assume that retention rates in the future will continue to be the same. In any case, should the drop-out rates decrease further, the effect on total cost will not be very important. The only effect in fact would be a larger pupil/teacher ratio in the higher grades.

Using these retention rates and the number of new admissions previously projected, it is simple to project the total enrolment of first-level education according to the three demographic hypotheses.[1]

To illustrate the effect of the increasing intake ratio, the change in the retention rates and the growth of school-age population on total enrolment, figure 1 shows the enrolment pyramid and the school-age pyramid in 1968, 1979 and 1989.

The shapes of these pyramids show clearly the result of the different policies decided upon. In 1968 there was still a clear distinction between lower and upper first-level, the enrolment ratio of standard V being only 21.4 per cent, while that of standard IV was 42.1 per cent. With the abolition of the selective examination in 1974, this distinction will no longer exist in 1979. Moreover, the difference between the enrolment ratio in standard I and standard VII will not be very large because the increase in the intake ratio during the 1970's will not be very rapid. The increase will be much more rapid during the 1980's. As a result, the difference in the enrolment ratio will be larger (from 95 per cent in standard I to 67.2 per cent in standard VII). Finally, the 95 per cent enrolment ratio for all grades of first-level education will only be reached in 1996. From then onwards enrolment in first-level education will follow the same rate of growth as that of the school-age population.

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1. The detailed projection of enrolment can be found in appendix, table 3.

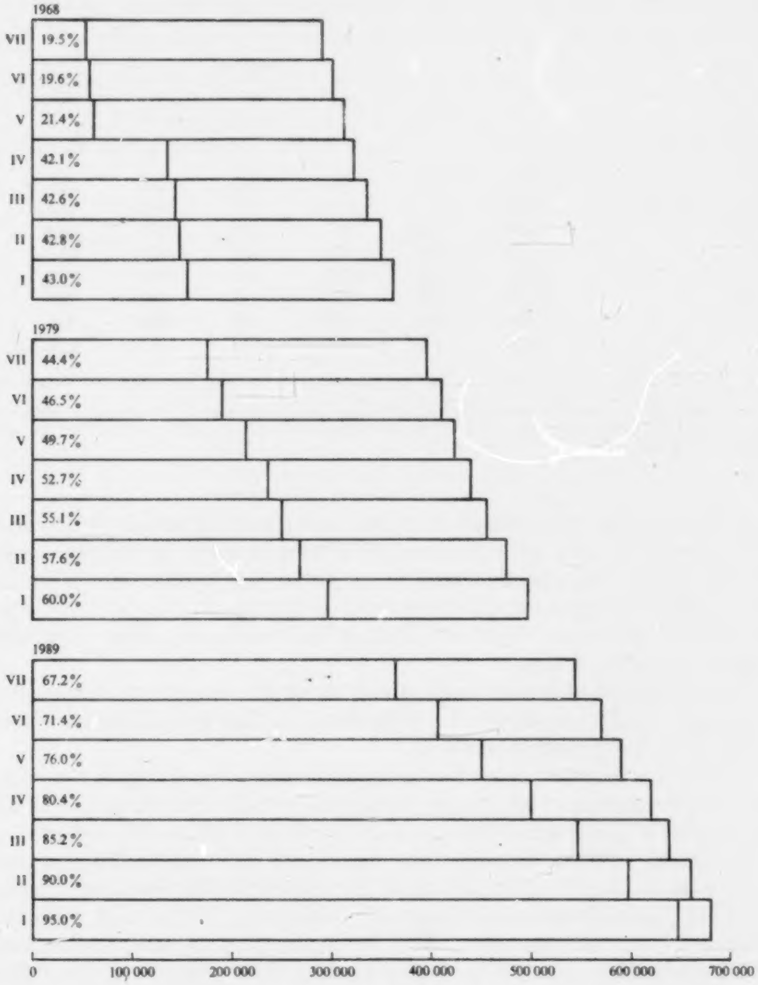

FIGURE 1. *School-age population, enrolment and enrolment ratio in 1968, 1979 and 1989 (mean demographic projection)*

Projection of teacher supply and demand

Firstly, the demand for teachers according to each of the three population assumptions will be projected. We will then try to see how teacher training should be developed, in order to meet teacher requirements.

The demand for teachers

As the different standards of first-level education are staffed with different categories of teachers, to project the required number of teachers, it is necessary to estimate the number of classes in each grade.

PROJECTION OF THE NUMBER OF CLASSES

Table 17 shows how the pupil/class ratio has evolved in the past.[1]

TABLE 17. Evolution of the pupil/class ratios 1962-67

Year	Standard							
	I	II	III	IV	V	VI	VII	VIII
1962	41.0	38.0	35.0	34.0	36.0	33.0	33.0	34.0
1963	42.0	39.0	37.0	34.0	43.0	38.0	35.0	36.0
1964	43.9	41.2	39.5	36.0	39.1	35.3	35.3	37.1
1965	44.1	41.7	41.1	40.6	43.0	40.9	40.7	41.6
1966	44.5	42.7	40.7	38.8	39.1	40.9	40.7	41.6
1967	43.3	41.3	39.9	39.1	41.0	38.5	41.8	42.1

SOURCE *Annual report of the Ministry of National Education*, 1962-67, op. cit.

This pattern clearly reflects the existence of two stages in first-level education. From standards I to IV the pupil/class ratio tends to decrease because of dropouts. It then tends to increase again in standard V after the selective examination and regrouping of classes.[2] It is also high in standards VII and VIII because of repeaters.

With the abolition of the selective examination in 1974, this pattern will change. From 1969 to 1974 the number in standard V will increase sharply because of the gradual increase of the transition ratio between standard IV and V. And one may assume that from 1971 onwards any new stream opened in standard I will continue through to standard VII.

The increase in both the intake ratio in standard I and in the transition ratio between standards IV and V will entail a very great effort regarding school building during the implementation of the Second Five-year Plan. Thus, the Ministry of National Education has decided to maintain the pupil/class ratio in standard I at its 1967 level, i.e. 43.3, during the plan period. After that date, because of the necessity of creating schools even in sparsely inhabited areas, the pupil/class ratio is expected to decrease gradually to forty.

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[1] First-level school classes are normally built to seat 45 pupils, but, of course the *average* size of a class is smaller.

[2] It is to be noted that total enrolment in standard V is less than half that of standard IV.

TABLE 18. Projection of the number of classes in the various standards of first-level education according to three demographic hypotheses

	Standard							
	I	II	III	IV	V	VI	VII	Total
Assumption I								
1969	3 773	3 702	3 627	3 555	1 646	1 590	1 487	19 380
1974	4 812	4 583	4 365	4 158	3 508	3 043	2 695	27 164
1979	6 605	6 188	5 793	5 415	5 055	4 812	4 583	38 451
1984	10 038	9 276	8 552	7 868	6 817	6 605	6 188	55 344
1989	14 859	13 783	12 765	11 803	10 896	10 038	9 276	73 382
Assumption II								
1969	3 773	3 702	3 627	3 555	1 646	1 590	1 487	19 380
1974	4 812	4 583	4 365	4 158	3 508	3 043	2 695	27 164
1979	6 871	6 417	5 986	5 577	5 187	4 812	4 583	39 433
1984	10 641	9 792	8 992	8 240	7 350	6 871	6 417	58 303
1989	16 509	14 839	13 691	12 611	11 595	10 641	9 792	89 678
Assumption III								
1969	3 773	3 702	3 627	3 555	1 646	1 590	1 487	19 380
1974	4 812	4 583	4 365	4 158	3 508	3 043	2 695	27 164
1979	7 140	6 643	6 172	5 728	5 307	4 812	4 583	40 385
1984	11 230	10 305	9 355	8 623	7 859	7 140	6 643	61 155
1989	17 213	15 855	14 584	13 391	12 275	11 230	10 305	94 853

SOURCE 1969-74: second five-year plan projection
1979-89: IIEP projection based on the assumptions made by the Ministry of National Education.

Using the above assumptions, the projection of the number of classes for each of the three population hypotheses is shown in table 18.

STAFFING FORMULAE

As we have seen earlier the policy concerning the qualifications of first-level teachers has changed somewhat in the past and the present policy is to give top priority to increasing the supply of teachers rather than improving the qualification profile.

The staffing formula envisaged by the Second Five-year Plan is as follows:

	Grade A	Grade B	Grade C
Standards I and II			1
Standard III			1
Standard IV			1
Standard V		1	
Standard VI	1		
Standard VII	1		1
TOTAL	2	1	4

According to officials of the Ministry of National Education, this staffing formula is not, however, completely satisfactory, because it imposes a very heavy working load on first-level school teachers and prevents the efficient implementation of in-service training schemes. This working load will increase even more in the future as first-level teachers will also teach in the adult education programme.

Thus we have presented two alternatives. The first one corresponds to the above-mentioned staffing formula. The second is an improvement of the situation. It assumes that there will be one supernumerary grade C teacher in each complete seven-standard school.

Application of the second staffing formula would, however, require a very rapid increase in the supply of teachers and it seems unlikely that this could be achieved during the 1974-79 period. We have therefore assumed that it will be gradually achieved from 1974 to 1984: the situation in 1979 corresponding to an intermediate stage where half the complete seven-standard first-level schools will receive supernumerary teachers.

PROJECTION OF THE REQUIRED NUMBER OF TEACHERS

The required number of teachers[1] projected on the basis of these two staffing formulae will expand as shown in figure 2.

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[1] For details about the number of teachers of the various categories, see appendix, table 1.

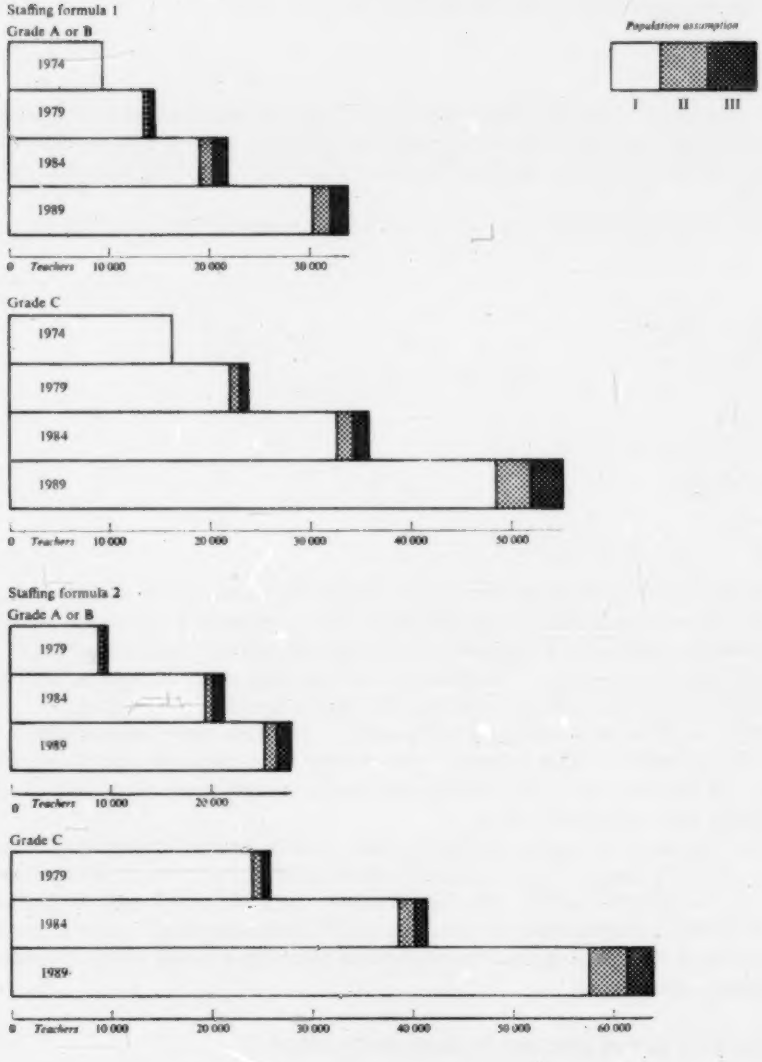

FIGURE 2. *Projection of the required number of teachers, 1974-89*

The supply of teachers

In projecting the supply of teachers, one must take into account the stock of teachers in 1970, the retention rate by length of service, the expected output of the teacher-training colleges and the in-service upgrading programme.

STOCK OF TEACHERS IN 1970

The distribution of teachers by category and length of service in 1970 is given in table 19. This shows clearly the various changes in the policy regarding the qualification profile of the teaching force. Before 1964 the output of grade A teachers was very low and the great majority of teachers were grade C. As a result of the First Five-year Plan policy to improve the qualification of the teaching force the annual output of grade A teachers increased from 86 in 1963 to 1,035 in 1969. This explains why the average length of service of grade A teachers is relatively low compared with the other categories of teachers. It should be noted that since 1965 the formal training of grade B teachers has been discontinued.

TABLE 19. Distribution of teachers by category and length of service, 1970

Length of service (years)	EO II	EO III	Grade A	Grade B	Grade C	Total
0-4	12	50	2 862	810	2 916	6 650
5-9	5	87	312	1 055	3 267	4 726
10-14	—	—	142	557	3 213	3 912
15-19	—	—	—	99	2 084	2 183
20-24	—	—	—	14	67	81
TOTAL	17	137	3 316	2 535	11 547	17 552

SOURCE Ministry of National Education, *Summary of the number of teachers at various scale points*, Dar-es-Salaam, 1970.

RETENTION RATE BY LENGTH OF SERVICE

The problem of loss of teachers in Tanzania is complicated by the fact that in addition to the normal causes of loss (change of activity, marriage, death and retirement) one also has to take into account selection for upgrading courses. The selected teachers leave their category but are not lost to the system as a whole.

Upgrading programmes exist for all categories of teachers from grade A to Educational officers III (second-level education teachers), from grade B to A and from grade C to B.

Although the causes for the loss of teachers are varied, it seems reasonable to assume that the loss is linked largely to length of service.[1]

We will thus use a rate of retention by length of service. One of the advantages of such a method of projection is that it permits us to have, for each year, a distribution of teachers by length of service and facilitates the precise calculation of the cost of teachers' salaries.

The retention rate by length of service has been estimated, taking into account all the causes for loss (see appendix, table 2).

THE STOCK OF TEACHERS IN 1974

The number of teachers available in 1974 is already determined by the planned output of the teacher-training colleges and of the various upgrading schemes. The 1974 stock of teachers can be projected as in table 20.

TABLE 20. Projection of the 1974 stock of teachers

Category of teachers	Stock in 1970	Teachers from 1970 stock and still in service in 1974	Teachers trained 1970-74 and still in service in 1974 [1]	Total teachers in 1974
Grade A/E.O.	3 470	3 196	3 409	6 605
Grade B	2 535	2 177	1 534	3 711
Grade C	11 547	9 376	5 032	14 408
TOTAL	17 552	14 749	9 975	24 724

1. Including output from upgrading programmes.

SOURCE IIEP projection on the basis of the planned output of teacher-training colleges, and of the various upgrading schemes, during the implementation of the Second Five-year Plan.

It is interesting to compare the situation in 1964 with that in 1970 and in 1974 and to see to what extent the effort made during the First and the Second Five-year Plans for the training of teachers will permit general application of the official staffing formula in all first-level schools in 1974.

Table 21 shows a deficit of teachers in 1970 and in 1974. The great number of grade C teachers trained during the Second Five-year Plan will not yet have entered the teaching force: the deficit of grade C teachers in 1974 will therefore have increased.

The total deficit, furthermore, should be interpreted cautiously. The number of teachers required, has in fact, been calculated according to the official staffing

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[1] Certain causes of loss (such as marriage, death and retirement) are linked to demographic factors and therefore depend upon the age distribution of teachers. Other causes (such as selection for upgrading courses) depend upon the length of service. One may assume the close relationship between length of service and age.

TABLE 21. Supply and demand of teachers, 1964-74

Type of teachers	1964	1970	1974
Grades A and B			
Number of teachers available	2 074	6 005	10 316
Number of teachers required [1]	2 748	5 192	9 246
Difference [2]	— 674	+ 813	+1 070
Grade C			
Number of teachers available	9 970	11 547	14 408
Number of teachers required [1]	10 100	12 879	16 030
Difference [2]	— 130	—1 332	—1 622
All teachers			
Number of teachers available	12 044	17 552	24 724
Number of teachers required [1]	12 848	18 071	25 276
Difference [2]	— 804	— 519	— 552

[1] This is the number theoretically required if the staffing formula is integrally applied.

[2] Minus sign means deficit.

SOURCE *Supply of teachers:*
1964: Mwingira and Pratt, op. cit., p. 172
1969: *Summary of the number of teachers at various salary scale points*, op. cit.
1974: IIEP projection
Requirement of teachers: calculated on the basis of the official staffing formula.

formula which envisages one teacher per standard and one additional grade C teacher in every group of standards VI and VII because the working-load of the teachers of these standards is higher than that of the other standards. The 1970 deficit is explained by the fact that contrary to the requirements of the staffing formula half-day sessions are still maintained in a certain number of standards III and IV and that an additional grade C teacher is not systematically posted in every group of standards VI and VII. In 1974 the deficit of teachers can also be overcome by this policy. Also, the deficit may be smaller should the retention rates of teachers be higher than is now expected.

One should also add that while there is a deficit for the total number of teachers required, conversely, there is a surplus in the higher trained categories of teachers. In other words the qualification profile of the teaching force has been much improved during the two successive Five-year Plans. This is particularly clear when the situation as it is in 1970, and as it will be in 1974, is compared with that of 1964.

PROJECTION OF THE SUPPLY OF TEACHERS DURING THE THREE QUINQUENNIAL PERIODS 1974-79, 1979-84 AND 1984-89

Starting with the 1974 stock of teachers, and using the method previously described (application of retention rates to project the surviving stock, taking into account

Table 22. Projection of the required supply of teachers[1] according to two staffing formulae and three population projections

	Period	Staffing formula 1			Staffing formula 2		
		Assump. I	Assump. II	Assump. III	Assump. I	Assump. II	Assump. III
Grade A	1974-79	3 410	3 546	3 670	3 410	3 546	3 670
	1979-84	3 272	4 056	4 829	2 693	3 476	4 249
	1984-89	7 100	7 591	8 088	5 399	5 830	6 273
Grade B	1974-79	2 338	2 338	2 338	2 338	2 338	2 338
	1979-84	4 180	4 335	4 486	4 753	4 908	5 060
	1984-89	6 794	7 249	7 682	8 501	9 014	9 502
Grade C	1974-79	11 600	12 234	12 852	13 938	14 571	15 190
	1979-84	16 363	17 597	18 758	21 042	22 509	23 900
	1984-89	26 570	29 427	31 307	31 787	35 014	37 258

[1] Including upgrading

Assumption I: low population growth
Assumption II: medium population growth
Assumption III: high population growth

Staffing formula 2 assumes one supernumerary grade C teacher in each complete seven standard school.

Source: IIEP projection.

length of service), we have calculated the supply of teachers required for each planning period, given the expansion of first-level education for each of the population assumptions and the two staffing formulae (see table 22).

In Tanzania, the supply of teachers comes from two main sources, the pre-service teacher-training colleges and the in-service upgrading programme. As selection for the upgrading programme takes place after a certain number of years of service, enrolment in upgrading programmes depends upon the output of teachers during previous years. Enrolment in teacher training on the other hand depends directly upon the requirements for additional teachers.

In order to appreciate the effort that has to be made in teacher training if the 1989 target is to be achieved, we have presented in figure 3 the comparative supply of teachers during the four quinquennial periods (1969-74, 1974-79, 1979-84, 1984-89). In this figure it has been assumed that the present staffing formula will be maintained in the future. The graph shows that, because of the increase of the intake ratio and because of population growth, the number of teachers to be trained during the 1984-89 period will be nearly four times higher than that which is envisaged in the present plan period. The difference observed in the three population projections is not very great, although it tends to increase in the successive periods, for these population projections are based on the same fertility assumption. Their difference therefore depends only on the decrease in mortality rates in the future.

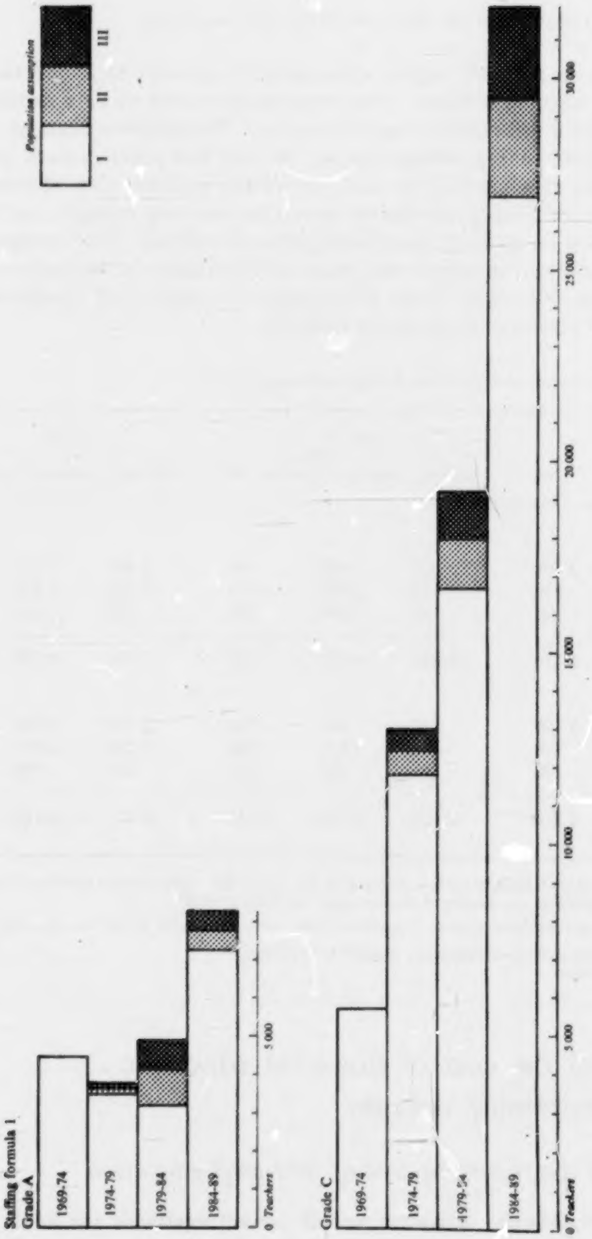

FIGURE 3. *Projections of the supply of teachers, 1969-89*

PROJECTION OF ENROLMENT IN TEACHER-TRAINING COLLEGES

On the basis of the required supply of teachers it is possible to project the enrolment in teacher-training colleges. For projection purposes we have assumed that the planning period will continue to be five years. We have also assumed that the output of teacher-training colleges during the first two years of each plan will depend upon the enrolment of the last year of the previous plan because of the number of students already enrolled in the teacher-training colleges, and because of the difficulty of immediately increasing physical facilities. The increase in the output of teachers will therefore take place mainly during the last three years of the planning period. With these assumptions, enrolment in teacher-training colleges may be projected as shown in table 23.

TABLE 23. Projection of enrolment in teacher-training colleges

Type of teachers	1969	1979 Assump. I	1979 Assump. II	1979 Assump. III	1989 Assump. I	1989 Assump. II	1989 Assump. III
Staffing formula 1							
Grade A [1]	2 300	821	914	998	3 465	3 473	3 488
Grade C	390	5 422	5 853	6 274	13 062	14 635	15 575
Upgrading [2]	120	191	191	191	572	612	650
TOTAL	2 810	6 434	6 958	7 463	17 099	18 720	19 713
Staffing formula 2							
Grade A [1]	2 300	821	914	998	2 532	2 501	2 479
Grade C	390	7 012	7 443	7 864	15 200	16 915	17 997
Upgrading [2]	120	191	191	191	725	770	816
TOTAL	2 810	8 024	8 548	9 053	18 457	20 186	21 292

1. Both grade A and grade B teachers teach in higher stage first level. The decrease in the enrolment of grade A is explained by the increase in the number of teachers upgraded from C to B.

2. Upgrading courses are part-time courses. The number given here is the number of full-time equivalent students.

SOURCE 1969: Ministry of National Education, unpublished document
1979-89: IIEP projection.

Projection of the cost of first-level education and teacher-training colleges

Projection of the recurrent cost of first-level education

Because of their different behaviour we will project separately the teacher salary cost and other recurrent costs of first-level education.

TEACHER SALARY COST

As mentioned earlier, with the method used in the projection of the stock of teachers of various categories, it is possible to obtain the structure of the teaching force, by length of service.

The present salary scale of first-level school teachers is as shown in table 24.

TABLE 24. Salary scale of first-level school teachers (shillings)

Length of service	Grade A	Grade B	Grade C
0- 4	7 320	5 460	3 800
5- 9	9 360	6 960	4 980
10-14	11 760	8 880	6 300
15-19	12 720	11 280	8 040
20+	12 720	12 720	8 880

In addition to their salaries, first-level school teachers also receive allowances (medical, dependant and transport allowances). Using the above salary scale and the projected structure of the teaching force, and taking into account the various allowances, teacher salary costs of first-level education may be estimated as in table 25.

TABLE 25. Projection of total salary cost of first-level education according to various assumptions (thousands of shillings)

Year	Type of cost	Staffing formula 1			Staffing formula 2		
		Assump. I	Assump. II	Assump. III	Assump. I	Assump. II	Assump. III
1979	Salaries	244 292	247 617	250 799	252 998	256 323	259 505
	Allowances	10 260	10 400	10 534	10 626	10 766	10 899
	Total	254 552	258 017	261 333	263 624	267 089	270 404
1989	Salaries	502 489	532 190	559 700	539 597	572 543	600 883
	Allowances	21 105	22 352	23 507	22 663	24 047	25 237
	Total	523 594	554 542	583 207	562 260	596 590	626 120

SOURCE IIEP projections.

With the rapid expansion of first-level education, due to the growth of population and the gradual increase in the intake ratio, the number of teachers to be recruited from 1974-89 will be very high. As a result, the average length of service of the teaching force will decrease. The rate of decrease will depend upon the growth of the population and also upon the staffing formula chosen. The decrease will be particularly sharp in the case of staffing formula 2, which will imply the use of one additional teacher in every complete seven-standard school.

The effect of this decrease in the length of service on the average salaries of grade C (where the decrease is the highest) and on all categories of teachers as a whole is shown in table 26.

TABLE 26. Effect of decrease in average length of service on average salaries of teachers (shillings)

	Staffing formula 1			Staffing formula 2		
	Assump. I	Assump. II	Assump. III	Assump. I	Assump. II	Assump. III
Grade C teachers						
1979	5 385	5 343	5 303	5 239	5 203	5 170
1989	4 980	4 924	4 984	4 897	4 852	4 821
All teachers						
1979	6 630	6 586	6 544	6 464	6 426	6 389
1989	6 368	6 288	6 267	6 119	6 064	6 032

SOURCE IIEP projection.

OTHER RECURRENT COSTS OF FIRST-LEVEL EDUCATION

According to the present plan other recurrent costs per pupil (i.e. maintenance, teaching materials, etc.) of first-level education are as follows: standards I-IV, thirty shillings; standards V-VI, thirty-five shillings; standard VII, forty shillings.

In so far as boarding costs are concerned, with the expansion of the first-level education system and the abolition of the examination between standards IV and V, all schools are likely to be day schools and therefore we need not take them into account.

As all projections are made in constant prices, we can assume that these unit costs will not change in the future. Other recurrent costs of first-level education may then be estimated as shown in table 27.

TABLE 27. Projection of the other recurrent costs of first-level education in 1979 and 1989 (thousands of shillings)

Year	Assumption I	Assumption II	Assumption III
1979	51 167	52 426	53 651
1989	105 781	113 091	120 162

SOURCE IIEP projection.

Capital cost of first-level education

The two main items of capital cost in first-level education in Tanzania are school buildings and teachers' accommodation. The latter, however, is only provided in rural areas. According to the 1967 census the urban population accounted for less than 5 per cent of the total population but because of rural/urban migration and because of the greater demand for education in urban areas, we have assumed that 20 per cent of all new schools will be built in urban areas.[1]

In urban areas the grant given by the government is 10,000 shillings for each classroom. This covers about half of the total cost. The rest is borne by local urban authorities.

In rural areas the grant covers only the building materials. Schools as well as teachers' accommodation are built through a self-help scheme. The grant for one teacher's accommodation is 8,500 shillings, while that for school building depends upon the level of the class to be added; this is because the level of the class influences the number of auxiliary units, such as toilets, store rooms or practical rooms.

TABLE 28. Building grants for rural schools (shillings)

	Classroom	Toilet	Store	Practical room	Total
Standards I and II [1]	5 800	1 500	3 300		10 600
Standard III	5 800				5 800
Standard IV	5 800				5 800
Standard V	5 800	900			6 700
Standard VI	5 800				5 800
Standard VII	5 800			5 800	11 600

1. Half-day sessions.

SOURCE Ministry of National Education, *1970 primary school development plan*, Dar-es-Salaam, 1969, pp. 1 and 2.

For projection purposes, we have assumed that these grants will not change in the future; we have also assumed a time-lag of one year between the beginning of the construction and the completion of schools.

As is evident from table 29, the capital cost of first-level education will be very high during the next two decades because of rapid expansion and the need to build new schools. The cost of teachers' accommodation will also be extremely high and will account for one third of the total capital cost in 1979 and for nearly

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[1] Even if the urbanization were to go at a faster rate than we have assumed, the incidence on the total cost borne by the government would be very little. The effect of the higher cost of an average classroom in urban areas would be counterbalanced by the fact that teacher's accommodation is not provided by the government in those areas.
As a result of information given by the Ministry of National Education, we have assumed that houses will be provided for only 70 per cent of the new teachers, the others being married women or teachers living on the home *shamba*.

TABLE 29. Total cost to the government of school buildings (thousands of shillings)

	1979			1989		
	Assump. I	Assump. II	Assump. III	Assump. I	Assump. II	Assump. III
Staffing formula 1						
Urban area	2 218	2 493	2 779	4 953	5 542	6 110
Rural area classroom	15 712	17 370	19 148	32 491	36 321	39 915
Teachers' accomm.	10 106	11 220	12 295	30 116	33 108	35 113
TOTAL	28 036	31 083	34 222	67 560	74 971	81 138
Staffing formula 2						
Urban area	2 218	2 493	2 779	4 953	5 542	6 110
Rural area classroom	15 712	17 370	19 148	32 491	36 321	39 915
Teachers' accomm.	13 396	14 322	15 444	31 935	35 088	36 958
TOTAL	31 326	34 185	37 371	69 379	76 951	82 983

SOURCE IIEP projection.

half (44.16 per cent) of that cost in 1989, on the basis of the present staffing formula. With the improved staffing formula which implies an additional teacher in every complete seven-standard school, the proportion will be even higher (41.9 per cent in 1979 and 45.6 per cent in 1989).

Recurrent cost of teacher training

The salary cost and the non-salary cost of teacher-training colleges will be projected separately.

SALARY COSTS OF TEACHER TRAINING

The main components of the salary cost of teacher-training colleges are: teachers' salaries, allowances and fringe benefits granted to teachers, and salaries of non-teaching staff. To these, one should also add the training allowances which are granted to students.

Taking into account the enrolment in teacher training colleges—which has been projected previously—as well as the staffing formula which is at present applied in teacher-training colleges, and using the present salary scale, we have estimated the various salary costs of teacher-training colleges.

NON-SALARY COST OF TEACHER-TRAINING COLLEGES

The main items of teacher-training non-salary cost are: boarding, equipment, and student travel. As the projection is made in constant prices, we have assumed

Table 30. Projection of the total cost of teacher-training colleges (thousands of shillings)

	1979			1989		
	Assump. I	Assump. II	Assump. III	Assump. I	Assump. II	Assump. III
Staffing formula 1						
Salary costs	12 689	13 690	14 705	33 909	37 113	39 049
Equipment	1 170	1 273	1 369	3 431	3 670	3 829
Boarding	3 860	4 175	4 478	10 259	11 232	11 828
Student travel	515	557	597	1 368	1 498	1 577
Others	3 675	3 852	4 022	8 780	9 327	9 663
Total	21 909	23 547	25 171	57 747	62 840	65 946
Staffing formula 2						
Salary costs	15 721	16 766	17 806	36 399	39 760	41 874
Equipment	1 408	1 511	1 607	3 402	3 653	3 814
Boarding	4 814	5 129	5 432	11 074	12 111	12 775
Student travel	642	684	724	1 477	1 615	1 703
Others	4 212	4 389	4 560	9 238	9 823	10 197
Total	26 797	28 479	30 129	61 590	66 962	70 363

SOURCE IIEP projection.

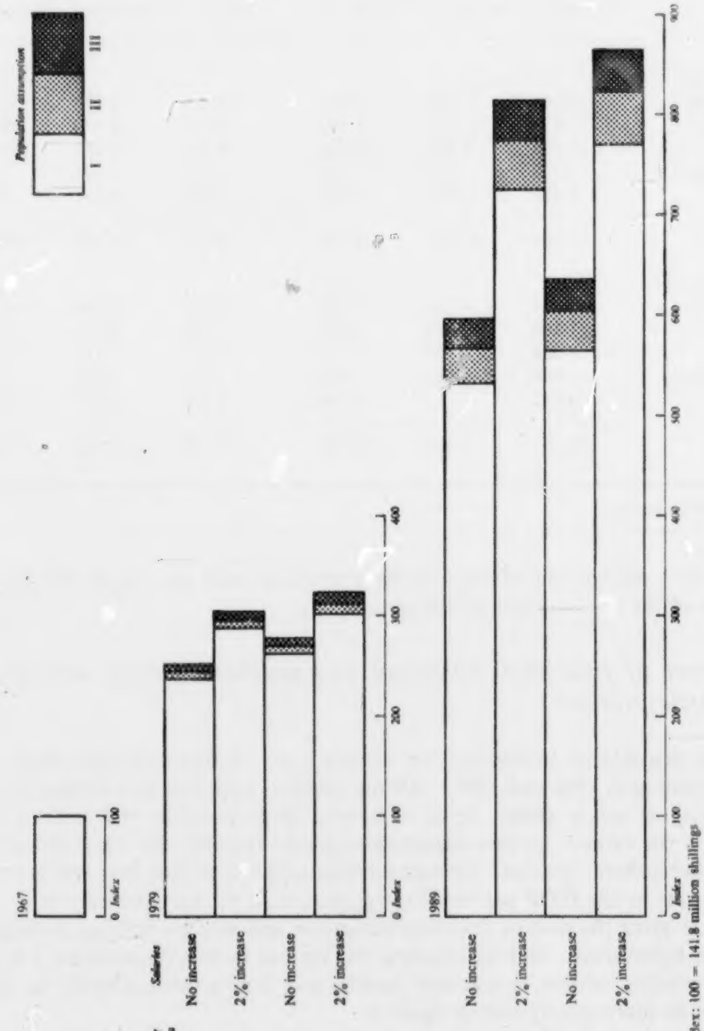
that the cost per student of each of these items is constant. Table 30 gives a summary of the various costs of teacher training.

Total cost of first-level education and teacher training, and gross domestic product

It is now possible to summarize the various costs of first-level education and teacher training in 1979 and 1989. All the previous estimates of cost were based on the present salary scale. It is, of course, quite possible that salaries will increase in the future. A new assumption should therefore be made about the increase in teachers' salaries. One possible assumption is that they will grow at the same rate as the GDP per working-age person (2 per cent per annum).

Table 31 gives the cost of first-level education and teacher training according to various hypotheses. But the effects of the various factors (improvement of the staffing formula, increase in teachers' salaries and demographic growth) on total costs, can be more clearly seen in figure 4.

Because of both the demographic growth and the increase in the intake ratio, total expenditure in 1979 and in 1989 will be 3 and 7.7 times respectively those of 1967. This clearly shows the size of the tremendous increase in expenditure implied by a policy of gradually achieving total admission when there is rapid population growth. Three particular facets should be emphasized.



Index: 100 = 141.8 million shillings

FIGURE 4. *Projection of the total cost of first-level education and of teacher training according to various hypotheses*

TABLE 31. Projection of total costs of first-level education and teacher training according to various hypotheses (thousands of shillings)

Staffing formula	Increase in salary	Type of costs	1967	1979			1989		
				Assump. I	Assump. II	Assump. III	Assump. I	Assump. II	Assump. III
1	No increase	First-level recur. cost	126 853	305 719	310 443	314 984	629 375	667 633	703 369
		First-level cap. cost	2 041	28 036	31 083	34 222	67 560	74 971	81 138
		Teacher-tr. cost	12 901	21 909	23 547	25 171	57 747	62 840	65 946
		TOTAL	141 795	355 664	365 073	374 377	754 682	805 444	850 453
		Index number	100	250.8	257.5	264.0	532.2	568.0	599.8
1	2 per cent increase per annum	First-level recur. cost	126 853	361 467	366 948	372 216	883 791	937 091	986 749
		First-level cap. cost	2 041	28 036	31 083	34 222	67 560	74 971	81 138
		Teacher-tr. cost	12 901	24 688	26 545	28 391	74 223	80 873	84 920
		TOTAL	141 795	414 191	424 576	434 829	1 025 574	1 092 935	1 152 807
		Index number	100	292.1	299.4	306.7	723.3	770.8	813.0
2	No increase	First-level recur. cost	126 853	314 791	319 515	324 055	668 041	709 681	746 282
		First-level cap. cost	2 041	31 326	34 185	37 371	69 379	76 951	82 983
		Teacher-tr. cost	12 901	26 797	28 479	30 129	61 590	66 962	70 363
		TOTAL	141 795	372 914	382 179	391 555	799 010	853 594	899 628
		Index number	100	263.0	269.5	276.1	563.5	602.0	634.5
2	2 per cent increase per annum	First-level recur. cost	126 853	372 525	378 007	393 273	941 243	999 564	1 050 514
		First-level cap. cost	2 041	31 326	34 185	37 371	69 379	76 951	82 983
		Teacher-tr. cost	12 901	30 240	32 151	34 029	79 276	86 282	90 709
		TOTAL	141 795	434 091	444 343	464 673	1 089 898	1 162 797	1 224 206
		Index number	100	306.1	313.4	327.7	768.6	820.1	863.4

SOURCE IIEP projection.

Firstly, although the impact of demographic growth on the cost of education is very important it can be seen that the differential effect of the three population projections on total cost is very slight in 1979 (5 per cent between the low and the high assumptions) and only a little higher in 1989 (13 per cent difference). This is due to the fact that the projections are based on the same high fertility trend, their only difference being the decrease in mortality rates. In other words, to assess the impact of population growth, one should not only compare these three population projections, one should also measure the overall effect of population growth.

Secondly, the difference shown by the improvement of the staffing formula is not very large either (6.7 per cent in 1979 and 5.98 per cent in 1989).

Thirdly, it is the possible increase in salaries (assumed here to be 2 per cent per annum) which will lead to the highest increase in cost, particularly in the long run (16 per cent in 1979 and 36 per cent in 1989).

Another way of assessing the effort required for the achievement of the 1989 target is to compare the total cost of first-level education and teacher training to GDP. According to the present plan the rate of growth of GDP should be 7 per cent per annum. This targets seems, however, very high and it is unlikely that it will be sustained during a twenty-year period. Moreover, the economic growth observed in the past has never reached such a high rate. It was estimated at about 5 per cent during the 1960's. Thus, for projection purposes, we have assumed that the rate of growth for the future will be 5 per cent per annum in constant prices.

In 1968 GDP at factor cost was estimated at 7,398 million shillings. On the basis of the above assumption, GDP will be 12,043 million shillings in 1979 and

TABLE 32. Percentage of GDP to be devoted to first-level education and teacher training according to the various assumptions

		1979			1989		
	1967	Assump. I	Assump. II	Assump. III	Assump. 1	Assump. II	Assump. III
Staffing formula 1							
No increase in salaries	2.06	2.95	3.03	3.11	4.04	4.31	4.55
2 per cent per annum increase	2.06	3.44	3.52	3.61	5.48	5.85	6.16
Staffing formula 2							
No increase in salaries	2.06	3.10	3.17	3.25	4.27	4.56	4.81
2 per cent per annum increase	2.06	3.60	3.69	3.86	5.83	6.22	6.55

SOURCE IIEP projection.

18,680 million shillings in 1989. The share of GDP to be devoted to first-level education and to teacher training in 1979 and 1989 may then be estimated for the various assumptions as shown in table 32.

These figures are self-evident. Even if the present staffing formula is maintained and teachers' salaries held constant during the whole period, and even with a fairly high and regular growth of GDP, the proportion of GDP to be devoted to first-level education and teacher training will increase from 2.06 per cent in 1967 to 3.03 per cent in 1979 and 4.31 per cent in 1989. In other words, this proportion will be nearly doubled in 1989 as compared to 1967. If the staffing formula is improved and teachers' salaries increase by 2 per cent per annum, the share will be trebled (3.69 per cent in 1979 and 6.22 per cent in 1989).

Conclusion

In this study we have tried to assess the effort required for the achievement of the 1989 target of universal admission to first-level education which consists essentially of gradually increasing the intake ratio and in improving the retention rate of first-level education. One convenient way of showing this effort is to compare the total cost of first-level education and teacher training in 1989 to that of 1967—which is the latest year for which data on actual expenditures are available.

Needless to say, all our estimates are based on the present organization of first-level education. Should the organization be entirely changed, or should the educational technology be significantly modified, these estimates would obviously be no longer valid.

If we take the highest alternative (i.e., an improvement in the staffing formula and an increase of 2 per cent per annum in teachers' salaries, together with the medium population projection,[1] the total cost of first-level education and teacher training will increase from 141,795,000 shillings in 1967 to 1,162,797,000 shillings in 1989. This would entail total costs increasing more than eight times during a twenty-two year period, i.e. a compound increase of about 10 per cent per annum.

This tremendous increase in total costs gives an idea of the difficulties encountered by developing countries in implementing universal first-level education. Obviously, the growth of the school-age population plays an important part in this increase in total cost. Its effects, however, have to be considered in conjunction with other factors such as the increase in the intake ratio, the increase in the retention rates, the improvement in the staffing formula and the increase in teachers' salaries. It would be interesting therefore, to isolate the effect of each of these factors.

In the case of the recurrent costs of first-level education in Tanzania, the effect of the various factors on the increase in total cost from 1967 to 1989 may be estimated as in table 33.

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1. The difference between the three population projections is not very large because they are all based on the same high fertility trend which is at present observed (corresponding to a gross reproduction rate of 3.2).

Table 33. Factors in increase of recurrent costs of first-level education, 1967-89

	Increase Coefficient
Increase in the school age population	1.9513
Increase in the intake ratio	2.1101
Increase in the retention rates	1.1304
Improvement in the pupil/teacher ratio	1.1907
Improvement in the qualification of teachers	1.1766
Improvement of the staffing formula	1.0758
Increase in teachers' salaries	1.4859
Decrease in the average length of service of the teaching force	0.9630
Decrease in non-salary costs	0.7850

NOTE The product of all the increase coefficients is equal to 7.8797.
This is the total coefficient of increase in expenditures from 1967 to 1989.

It is evident from table 33 that the effect of demographic growth is very important. Alone, it would lead to nearly doubling the present expenditures in a twenty-two year period. It is, however, the increase in the intake ratio which plays the greatest part in the increase in total cost. The factor ' improvement in the qualification of teachers ' expresses the existence of a higher proportion of grade A and B teachers following both a better application of the staffing formula and the generalized promotion of pupils to higher stage first-level schools. Also, there are two negative (saving) factors — the decrease in the average length of service of the teaching force due to the importance of the recruitment in the last years, and the decrease in non-salary cost following the abolition of boarding schools.

The aim of this study is not to test the feasibility of the 1989 target. An idea about the effort to be made may be obtained, however, by looking at the proportion of GDP to be allocated to first-level education and teacher training in 1989 as compared to 1967. Even if GDP is assumed to rise at a sustained and rather high rate of growth during the next two decades *and* without any improvement in the staffing formula or any increase in teachers' salaries, the proportion of GDP to be allocated to first-level education and teacher training would nearly double by 1989. Should the staffing formula be improved and salaries increase as we assumed, this share would treble.

If the fertility trend continues to be as high as it is at the present time, if the real growth of population corresponds to the medium population projection, and if, on the other hand, the total cost of first-level education and teacher training is judged to be too high taking into account the available resources, the alternative would be either to postpone the target year — which would lead to a less rapid increase in the intake ratio — or to maintain the present staffing formula, or to prevent teachers' salaries from increasing as quickly as it has been assumed in this study, or a combination of these three measures. The relative importance of the effect of each of these measures is shown in the above-mentioned increase coefficient.

Appendix

TABLE 1. Projection of the number of teachers required, 1974-89

	1974	1979	1984	1989
STAFFING FORMULA 1				
Assumption I				
Grade C	16 030	22 396	32 646	48 703
Grade A or B	9 246	14 450	19 610	30 210
TOTAL	25 276	36 846	52 256	78 913
Assumption II				
Grade C	16 030	23 017	34 290	52 603
Grade A or B	9 246	14 582	20 638	32 028
TOTAL	25 276	37 599	54 928	84 631
Assumption III				
Grade C	16 030	23 623	35 851	55 493
Grade A or B	9 246	14 702	21 642	33 810
TOTAL	25 276	38 325	57 493	89 303
STAFFING FORMULA 2				
Assumption I				
Grade C		24 687	38 834	57 979
Grade A or B		14 450	19 610	30 210
TOTAL		39 137	58 444	88 189
Assumption II				
Grade C		25 308	40 707	62 395
Grade A or B		14 582	20 638	32 028
TOTAL		39 890	61 345	94 423
Assumption III				
Grade C		25 914	42 494	65 798
Grade A or B		14 702	21 642	33 810
TOTAL		40 616	64 136	99 608

NOTES

Staffing formula 2 assumes one supernumerary grade C teacher in each complete seven-standard school.
Assumption I: low population growth.
Assumption II: medium population growth.
Assumption III: high population growth.

SOURCE IIEP projection.

TABLE 2. Quinquennal rate of retention of various categories of teachers

Category of teachers	Length of service	Retention rate	Selection for upgrading courses	Apparent retention rate
Grade A	from graduation to 4	.970	—	.970
	from 0-4 to 5-9	.930	.050	.880
	from 5-9 to 10-14	.890	.030	.860
	from 10-14 to 15-19	.890	—	.890
	from 15-19 to 20-24	.870	—	.870
	from 20-24 to 25-29	.830	—	.830
	from 25-29 to 30-34	.790	—	.790
Grade B	from graduation to 4	.970	—	.970
	from 0-4 to 5-9	.940	.100	.840
	from 5-9 to 10-14	.900	.100	.800
	from 10-14 to 15-19	.850	—	.850
	from 15-19 to 20-24	.820	—	.820
	from 20-24 to 25-29	.750	—	.750
	from 25-29 to 30-34	.700	—	.700
Grade C	from graduation to 4	.980	—	.980
	from 0-4 to 5-9	.950	.250	.700
	from 5-9 to 10-14	.940	.350	.590
	from 10-14 to 15-19	.925	—	.925
	from 15-19 to 20-24	.900	—	.900
	from 20-24 to 25-29	.875	—	.875
	from 25-29 to 30-34	.850	—	.850

SOURCE John D. Chesswas, 'Tanzania: factors influencing change in teachers' basic salaries', in *Educational cost analysis in action: case studies for planners*, Vol. I, Paris, Unesco:IIEP, 1972.

TABLE 3. Projection of first-level education enrolment, 1968-89

	1968	1974	1979	1984	1989
Assumption I					
Standard I	155 802	208 340	282 700	419 600	598 800
Standard II	148 188	195 604	261 800	384 100	551 800
Standard III	142 353	183 671	242 100	350 800	507 500
Standard IV	136 449	172 490	223 600	319 600	465 900
Standard V	67 417	147 324	204 200	271 500	422 800
Standard VI	57 579	124 750	190 000	257 800	382 700
Standard VII	57 381	107 880	176 600	238 000	346 700
TOTAL	765 169	1 140 059	1 581 000	2 241 400	3 276 200
Assumption II					
Standard I	155 802	208 340	294 100	444 800	647 200
Standard II	148 188	195 604	271 400	405 500	594 100
Standard III	142 353	183 671	250 200	368 900	544 300
Standard IV	136 449	172 490	230 300	334 700	497 800
Standard V	67 417	147 324	209 500	299 900	449 900
Standard VI	57 579	124 750	190 000	268 200	405 700
Standard VII	57 381	107 880	176 600	246 700	366 100
TOTAL	765 169	1 140 059	1 622 100	2 368 700	3 505 100
Assumption III					
Standard I	155 802	208 340	305 600	469 400	693 700
Standard II	148 188	195 604	281 000	426 700	634 700
Standard III	142 353	183 671	258 000	383 700	579 800
Standard IV	136 449	172 490	236 500	350 200	528 500
Standard V	67 417	147 324	214 400	313 000	476 300
Standard VI	57 579	124 750	190 000	278 700	428 100
Standard VII	57 381	107 830	176 600	255 300	385 200
TOTAL	765 169	1 140 059	1 662 100	2 477 000	3 726 300

SOURCE 1968: actual figures
1974: second five-year plan projections
1979-1989: IIEP projection.

Tunisia: a case study

Claude Tibi

Contents

General information on Tunisia 229

Introduction 230

I. The development and financing of educational expenditure 232
Economic evolution in Tunisia from 1960 to 1969 232
Educational expenditure 234

II. The development of first-level education 242
Policy for the development of first-level education 242
Recurrent costs and their financing: unit costs 249
Capital expenditure and building costs 252

III. The effect of demographic growth on the trend of enrolments and expenditures of first-level education 254
Projection of the development of first-level education and teacher training in 1979 and 1989 254
Projection of the cost of first-level education and teacher training 265

Conclusion 272

Appendix 275

EXPLANATORY NOTE

This report has been prepared from materials supplied by the Ministry of Education and from the findings of a research mission in Tunis carried out during April 1970. The Institute is very grateful to the Ministry of Education, the Secretary of State, Ministry of Planning, and the Tunisian Delegation to Unesco, for their total co-operation and assistance.

General information on Tunisia

THE COUNTRY

Tunisia has an area of 63,380 square miles of which about 47 per cent is under cultivation.

THE POPULATION

On the 1st January 1970, the population was estimated at a little over five million inhabitants, of whom 46 per cent were under the age of 15. The population is increasing at the rate of 2.8-2.9 per cent per annum. The density is about 80 per square mile with most of the population concentrated along the northern and eastern coasts. More than 70 per cent of the population live in rural areas.

THE ECONOMY

The gross domestic product, at market prices, reached 583 million dinars in 1969, so that GDP per capita was of the order of $ 220. During the period 1960-69, GDP grew by the average rate of 4.7 per cent per annum. Agriculture represented practically 20 per cent of production, and industry (mainly mining and the building trades) a little more than 35 per cent. (U.S. $ 1 = 0.525 dinars, 1969.)

Introduction

The object of this study is to determine the effect of population growth on the development and cost of first-level education in Tunisia using different assumptions about staffing formulae and teacher training on the one hand and economic evolution on the other.

The scope of this study has been limited to first-level education, since this is the level at which the effects of population growth are first felt and are most marked.

The Ten-year Education Plan 1959/60-1968/69 formulated by the Tunisian government provided for the enrolment, by the end of the period, of all six-year-olds. It follows that future population growth should influence first-level enrolments almost automatically.

Second-level admissions up to 1969 have been arrived at by taking 40 per cent of enrolments in the last grade of first-level education. It can therefore be estimated that the effects of population growth will be partly passed on to the second level.[1] Various measures have, however, recently been taken by the Ministry of National Education, trying in particular, to limit access to second-level education. In these circumstances it seemed preferable to *limit* the study of demographic effects to first-level education.

It should also be noted that the population growth rate tends to increase in Tunisia, as in many other developing countries, owing to the decline in mortality, to the rapidly increasing number of women reaching child-bearing age, and also to an increase in birth rate following improved health conditions.

The recognition of this has led the Tunisian government to take various measures of birth control and thus to slow down the population growth. It is, however, difficult to assess, at the present stage, the *quantitative* effects of this policy, since the results will depend on a whole series of social, religious and economic factors whose influence is difficult to measure.

It is for this reason that we have preferred to determine on the basis of certain assumptions as to fertility, what the population trend might be. These assumptions are obviously connected with the speed at which some results in the matter of birth control can be achieved. In each case the growth in enrolments and costs of first-level education have been assessed. It is thus possible to project and compare the consequences of the various population assumptions on enrolment and cost in 1979 and in 1989.

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[1] With a lag of about eight years after entry into first-level school, allowing for the average length of first-level schooling.

Finally, it should be noted that, in 1969, recurrent expenditure on first-level education and teacher training represented about 55 per cent of the budget of the Ministry of National Education and more than 3 per cent of gross national product (GNP).

These figures alone are enough to explain the importance which must be attached to the study of the cost increase of first-level education.

Part I of the study will be devoted to a historical analysis of the trends of economic development over the last ten years, and growth and financing of educational expenditure. Part II will examine the characteristics of first-level education and its development since 1960. Finally, part III will give projections of enrolments on the different population growth assumptions, as well as the requirements for teachers and classrooms. We shall also estimate recurrent and capital expenditures.

I The development and financing of educational expenditure

The object of part I is to study the trend of educational expenditure in Tunisia over the last decade within a general economic framework.

For this purpose, the first section analyses the economic growth from 1960 to 1969, and the second studies the increase and the financing of educational expenditures.

Economic evolution in Tunisia from 1960 to 1969

Over the last decade Tunisia has experienced undeniable economic growth, since its GDP (in volume) has increased at an average rate of 4.7 per cent per annum over that period (see table 1).

TABLE 1. Evolution of main aggregates at constant prices (millions of 1966 dinars)

	1960	1965	1969	1970[1]
Gross domestic production (at market prices)	345.9	445.4	491.5	523.3
Salaries of civil servants and household services	49.3	65.8	91.8	101.9
Gross domestic product	395.2	511.2	583.3	625.2
Gross national product	396.6	497.4	557.8	598.9

1. Ministère du Plan, *Rapport sur le budget économique de l'année 1971*, Tunis, République Tunisienne, 1971

It is valuable, however, to analyse the components of this evolution in detail. Reference to gross domestic production (at market prices) shows that the growth rate did not exceed an average of 4.2 per cent per annum. This deviation between the two rates is due to a growth in the activity of general government agencies well above that of the production of goods and services, since it reached a rate of 7.5 per cent per annum during the period under review.

Economic development (see table 2) occurred mainly in the industrial sector [1] since, apart from major variations due to weather hazards, agriculture has made no progress over the last ten years. Services, finally, have increased moderately, partly as a result of the impetus of tourism.

TABLE 2. Gross domestic production (at factor cost) by sectors of activity. (Constant prices: millions of 1966 dinars)

	1960	1965	1969	1970 [1]
Agriculture	85.2	102.5	80.3	84.8
Industry	84.7	116.7	154.6	166.6
of which oil	—	(3.0)	(24.3)	(24.3)
Services	118.5	156.7	169.7	181.2
of which tourism	(1.3)	(4.8)	(12.5)	14.6)
TOTAL	288.4	375.9	404.6	432.6

[1] *Rapport sur le budget économique de l'année 1971*, op. cit.

This growth was made possible by a rapid development of investments (see appendix, table 1). Gross fixed capital formation as a percentage of GDP rose, in fact, from 17.8 per cent in 1960 to 24.1 per cent in 1964. The major part of this increase was concentrated in the industrial and agricultural sectors, and in public utilities including educational facilities.

The rapid development of investments has created growing needs for capital. To meet this, the Tunisian authorities have tried to develop internal saving, whose proportion of GDP rose from 10 per cent at the beginning of the decade to 17.5 per cent in 1969. This increase is mainly due to the saving of enterprises; public saving (see appendix, table 2) has fluctuated widely over the last ten years, but has, on average, remained at a relatively low level. In 1964-65, the current surplus (savings) of general government reached 35 to 36 per cent of national savings. Since then, it has tended to fall appreciably, representing no more than 22 per cent of national savings in 1969.

This is explained by the fact that current expenditure of general government (especially educational expenditure) has tended to increase faster than current revenue, in spite of progressively heavier taxation.

The increase in savings has unfortunately not kept pace with the increase in needs. The results has been a very considerable appeal for external capital (see appendix, table 3). Between 1960 and 1969, the proportion of net external resources in the financing of total capital formation (gross fixed capital formation

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[1] The discovery of certain oilfields has acted as a stimulus in this sector.

+ change in inventories + variations in foreign exchange reserves) fluctuated between 35 per cent and 57 per cent and the average for the decade lies between 46 and 47 per cent. This has meant a very rapid increase in the external debt which, at the end of 1969, amounted to 286.4 million dinars or 53.7 per cent of GDP.

Reimbursements have followed a similar trend, so that debt servicing now represents a heavy drain on foreign currency.

It has proved particularly difficult to finance the capital transactions of general government (see appendix, table 4) owing to the trend of saving analysed above. In addition to external aid, it has been necessary to resort to internal borrowing and short term borrowing, including treasury bills which have created inflationary pressures.

Educational expenditure

There are a number of bodies which provide education in Tunisia: the Ministry of National Education; various technical ministries; the French University and Cultural Mission; the private sector. In the public sector, moreover, part of the expenditure is financed from external aid. In these circumstances, it is therefore difficult to determine educational expenditure precisely; in practice, owing to the diversity of donor countries and of recipient agencies the specific contribution of external aid is known only partially. Furthermore, the expenditure of the private sector is unknown. We shall therefore limit the study to public educational expenditure[1] and then try to estimate the contribution of external aid.

Recurrent expenditure

Recurrent expenditure of the Ministry of National Education[2] (which in 1968 represented 86 per cent of recurrent educational expenditure of the public sector) has increased extremely fast over the last ten years (see table 3). Its amount (at current prices) was multiplied by 3.4 between 1961 and 1970, and its proportion of GNP went up from 3.3 per cent in 1961 to 6.4 per cent in 1970.

This trend results from a substantial increase in enrolments, as well as from an increase in unit costs at all levels of education. It is likely to continue over the next few years, in spite of the measures recently taken with a view to limiting access to second-level education and cutting unit costs by reducing teaching hours.

BREAKDOWN OF RECURRENT EXPENDITURES BY LEVEL OF EDUCATION

Table 4 shows the breakdown of recurrent expenditures of the Ministry of National Education by level of education and its variations between 1962 and 1968. The

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[1] Since enrolments in the private sector represent little more than 1 per cent of total enrolments, the error is negligible.

[2] Not including the contribution of external aid.

TABLE 3. Recurrent expenditure of the Ministry of National Education, budget and gross national product (millions of dinars)[1]

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Recurrent budget of the Ministry of Education (a)	12.0	13.3	14.8	17.6	20.6	24.6	28.0	31.2	35.7	41.0[2]
Total recurrent budget (b)	55.8	56.8	60.0	66.0	84.3	98.3	105.2	117.4	131.3	146.5
(a) as percentage of (b)	21.5	23.4	24.7	26.6	24.4	25.0	26.6	26.5	27.2	28.0
GNP (c)	365.7	370.6	395.6	428.0	483.6	493.3	511.1	558.7	596.9	646.0
(a) as percentage of (c)	3.28	3.59	3.74	4.11	4.25	4.98	5.48	5.58	5.98	6.35

1. As from 1965 certain expenditure is incorporated with the recurrent budget, so that budget *totals* before and after 1965 are not comparable.
2. In the 1970 budget appropriations to the Secretariat of State for Youth and Sports have been merged with those of the Ministry of National Education. The amount shown represents the estimated appropriations earmarked for the Ministry of National Education.

TABLE 4. Percentage breakdown of recurrent expenditures of Ministry of Education by levels of education

	1962 (percentage)	1965 (percentage)	1968 (percentage)
Administration	2.6	1.9	1.9
First level	58.9	52.7	46.9
Second level	29.1	32.0	37.3
Third level	4.4	5.9	7.5
Social	5.0	7.5	6.4
TOTAL	100.0	100.0	100.0

SOURCE Breakdown of Ministry of National Education budgets (IIEP).

proportion spent on first-level education has fallen steadily, while the share of second-level, intermediate and third-level education has grown.

This trend is the result of the very substantial progress *already* made in first-level enrolments, which could progress more slowly in the future. Second-level enrolments, on the other hand, will increase even more in the next few years following the increased flow of first-level school leavers.

Third-level education, moreover, will continue to develop fast in the light of needs. The total share of second- and third-level education in the recurrent budget of the Ministry of National Education will continue to grow, particularly as unit costs are much higher there than in first-level education.

Capital expenditures

Table 5 shows the trend of capital expenditures [1] of the Ministry of National Education and all general government agencies (including extra-budgetary expenditures financed by external aid). The growth in capital investment over the last decade appears particularly marked and the level reached in the last few years is very high; in 1968, capital expenditures by the Ministry of National Education and general government agencies amounted to 1.5 and 2.1 per cent of GNP respectively.

Breakdown of educational expenditures by source of finance—recurrent expenditures

Virtually all recurrent expenditures are financed from public funds.[2] The main exception (leaving aside private education, which is of limited importance) is that part of the salaries of foreign teachers borne by external aid.

[1] Appropriations disbursed.

[2] We disregard here the costs of the French Cultural Mission schools in Tunisia, for their enrolments are partly non-Tunisian children.

TABLE 5. Capital expenditures on education: Ministry of National Education and general government (millions of dinars)

	1961	1962	1963	1964	1965	1966	1967	1968	1969
Capital expenditure by Ministry of National Education (a) [1]	2.5	2.4	5.0	6.2	7.9	7.2	5.5	8.2	8.8
Capital expenditure on education by general government [2]	2.8	2.8	5.3	6.7	11.0	11.8	13.2	11.7	—
Total gross fixed capital formation (b)	68.3	76.1	88.6	105.1	132.3	128.9	126.6	127.2	135.3
(a) as percentage of (b)	3.7	3.1	5.6	5.9	6.0	5.6	4.3	6.4	6.5

1. Appropriations.
2. Including capital expenditure financed by extra-budgetary funds and by local authorities.

Table 6 gives all public expenditures on education (recurrent and capital) according to the way they are financed (the resources of each budget or fund are of different types). Public recurrent expenditures on education are mainly found in the recurrent budget, but a small part of them (devoted to vocational training) is financed by special funds.

The largest figure in the recurrent budget corresponds to the Ministry of National Education, (31.2 million dinars in 1968), but other ministries also have educational activities (Public Works, Health, Planning, National Economy, Agriculture, etc.). In these circumstances, the total recurrent educational expenditure shown in the recurrent budget was 36.0 million dinars in 1968.

Special funds contributed 0.3 million dinars in 1968 towards financing recurrent educational expenditure.[1]

It is difficult to determine the contribution of external aid, for two reasons:

(a) the diverse origins of foreign teachers;

(b) the diversity of their status (and therefore of the cost-sharing between the Tunisian government and the foreign country).

It may, however, be noted that the majority of foreign teachers are of French nationality (93.8 per cent) and that they benefit from the cultural agreement between the two countries.

TABLE 6. Breakdown of public educational expenditures by sources of finance in current prices (thousands of dinars)

	1965	1966	1967	1968
Recurrent budget	23 633	28 550	31 763	36 032
Capital budget	9 453	10 162	10 831	8 851
Special funds	385	1 081	402	268
Extra-budgetary	903	763	1 953	2 239
Total, central government	34 374	40 556	44 949	47 390
Local authorities	382	300	93	—
Social security	—	387	221	542
Total, government	34 756	41 243	45 263	47 932

Under this agreement, French teachers are paid their basic French salary multiplied by a coefficient of 1.8 and are entitled to family allowances at a relatively high rate. Financing under 'A' contracts is shared in the proportion of one-third by France, (up to a maximum of about twenty million Francs)[2] and two-thirds by Tunisia. All contracts above this maximum (' B ' contracts) are entirely financed by Tunisia. Finally, it may be noted that a relatively large number of French national servicemen are assigned to technical co-operation as teachers and are paid a standard salary of 1,428 dinars a year, well below the normal rate. In the aggregate, the breakdown of *all* French technical co-operation staff serving in Tunisia (in second- and third-level education and as educational advisers in first-level school districts), was as follows in 1969/70:

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[1] Note that the use of the special funds may be different from year to year. They may be used to finance *capital* expenditures.

[2] i.e. about 2 million dinars.

'A' contracts	1 313
'B' contracts	1 127
National servicemen	603
TOTAL	3 043 [1]

The terms of remuneration of non-French foreign teachers are very variable (' foreign ' contracts under Tunisian public law; contracts under agreements made with Belgium; etc.) which in some cases result in a more advantageous distribution of costs for Tunisia.

The overall contribution of external aid to recurrent expenditure for 1969/70 can be estimated at a little more than two million dinars.

Capital expenditure

Capital expenditure appears mainly in the central government development budget (see table 6) but there are four additional sources of finance:

1. Loans from external aid (IBRD, SIDA, etc.) which are direct to projects and which are intended for the construction of second-level and third-level education establishments;
2. The special funds which, in some years, have contributed to financing capital expenditure;
3. The contribution of the local authorities (limited to first-level education), which has always been relatively small and has, moreover, tended to fall off to nothing in recent years; up to 1962, in fact, for all building projects of first-level schools of a so-called local authority type (95 per cent of the total), the government made a grant of 700 dinars per classroom or per teachers' accommodation and the local authorities had to make up the difference. Growing difficulties appeared in local financing. From 1963, the government decided to finance all building costs except for ancillary premises (sanitary blocks, storage tanks, wells, etc. and refectories, kitchens, etc.), the cost of which had been borne by the local authorities;
4. Finally, the Social Security Scheme, which has a relatively high surplus, has also contributed towards financing capital expenditure.

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[1] SOURCE Secrétariat d'Etat et à l'Education Nationale (SEEN), personnel service.

Table 7. Public educational expenditure – current prices (millions of dinars)

	1960	1961	1962	1963	1964	1965	1966	1967	1968
Recurrent expenditure	11.6	14.3	16.2	19.7	22.9	23.7	29.4	32.1	36.3
Capital expenditure	2.2	2.8	2.8	5.3	6.7	11.0	11.8	13.2	11.6
Total expenditure	13.8	17.1	19.0	25.0	29.6	34.7	41.2	45.3	47.9
Total expenditure as percentage of GNP	4.14	4.68	5.13	6.32	6.92	7.18	8.35	8.86	8.57

Overall trend of public educational expenditure

Since 1960, public educational expenditure has grown continually at a very fast pace (see table 7). The results are particularly striking and must be regarded as disturbing. Since 1968, more than 8 per cent of GDP has been devoted to education, and it seems highly probably that in 1970 it must approach or even reach 9 per cent. Tunisia must certainly be regarded as one of the world's leading countries, if not the leading country in respect of the proportion of its resources allocated to education. This trend calls for certain comments:

1. Education has played a particularly important part in the growth of public expenditure and its effects on general government saving.
2. The social role of education has been given as much consideration as its economic role, if not more.

II The development of first-level education

The principles of the government educational policy for first-level education have been formulated in the Education Reform Act, 1958, which provided, notably, for the universal first-level education of six-year-olds. The ten-year educational perspective plan (1959/60-1968/69) then translated these general guidelines into terms of quantitative targets (enrolments, teacher training, school buildings, running and capital costs). This action programme has been put into practice over the last decade, but although the enrolment forecasts have been slightly exceeded, access to first-level education is not yet universal, owing to the fact that population growth, and therefore the number of children to be enrolled, was underestimated.

We now propose to analyse the effects of the government's educational policy on enrolments, teacher requirements and training at various levels of qualification, costs and financing.

Policy for the development of first-level education

In view of the object of our study, we shall concentrate on two aspects of the question, first the structure and quantitative expansion of the system, and secondly, decisions as to teacher training.

Structure and quantitative expansion of first-level education

The Education Reform Act, 1958, stipulated that Moslem religious education should be progressively integrated into the public education system; but the schools organized and financed by the French University and Cultural Mission (mainly intended for the children of French nationals) were allowed to continue to operate. The same can be said about private education, which is largely religious. (In both these cases, enrolments are very few compared with those in the public sector.)

The reform laid down the principle that all six-year-olds should have access to first-level education. The length of schooling was fixed at six years with a selective

TABLE 8. First-level enrolments, by sector, 1967/68

	Enrolments	Percentage
Public sector	810 795	98.1
French Cultural Mission	4 503 [1]	0.6
Private sector	11 028	1.3
TOTAL	826 326	100.0

1. Including children in nursery schools.

examination giving access to second-level education. The ten-year plan further provided for a universal admission to first-level education for the year 1968/69. Finally, it may be noted that the targets were set in terms of admissions and total enrolments.

For the first two grades of first-level education, the school timetable was reduced to 15 hours a week,[1] (instead of the previous 30 hours) so as to use one teacher [2] for two classes. For the four other grades, the timetable was fixed at 25 hours [3] a week, so that five teachers could teach six classes. The main object of this reform was to reduce the number of hours taught per grade so as to reduce the rate of increase in the number of teachers and classrooms for the early years and to allow for a sufficiently fast expansion of first-level education.

Admission to second-level education has been about 40 per cent of the enrolment of the last grades of first-level education. One third of pupils were to be admitted into intermediate education (three years general, commercial or industrial education) and two-thirds into general, business or technical second-level education (six years, divided into two cycles of equal length). Figure 1 summarizes the structure of first- and second-level education.[4]

The consequence of this policy has been an extremely fast expansion of first-level education (see table 9). In nine years admissions have doubled, thus increasing at an average rate of 8 per cent per annum. In ten years total enrolments have increased by 164 per cent, or an average rate of 10.2 per cent per annum. On the basis of estimates of the number of six-year-olds in 1959, the admission rate for the school year 1959/60 can be estimated at about 59 per cent. For the year 1969/70, in the light of population projections by age based on the 1966 census, it seems that the admission rate reached 86 to 87 per cent.

Table 10 shows the total enrolments estimated in the ten-year projection 1958/59-1968/69 and the actual enrolments. The deviations between estimated and actual enrolments are relatively small, but universal education as forecasted has

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[1] It should, however, be noted that these timetables have been increased to twenty-five hours a week since 1969.

[2] First-level school teachers are required to do thirty hours teaching a week.

[3] In the sixth year, the school timetable has been increased to twenty-seven and a half hours a week since 1967.

[4] Valid up to 1970. A structural reform of second-level education was introduced in October 1970.

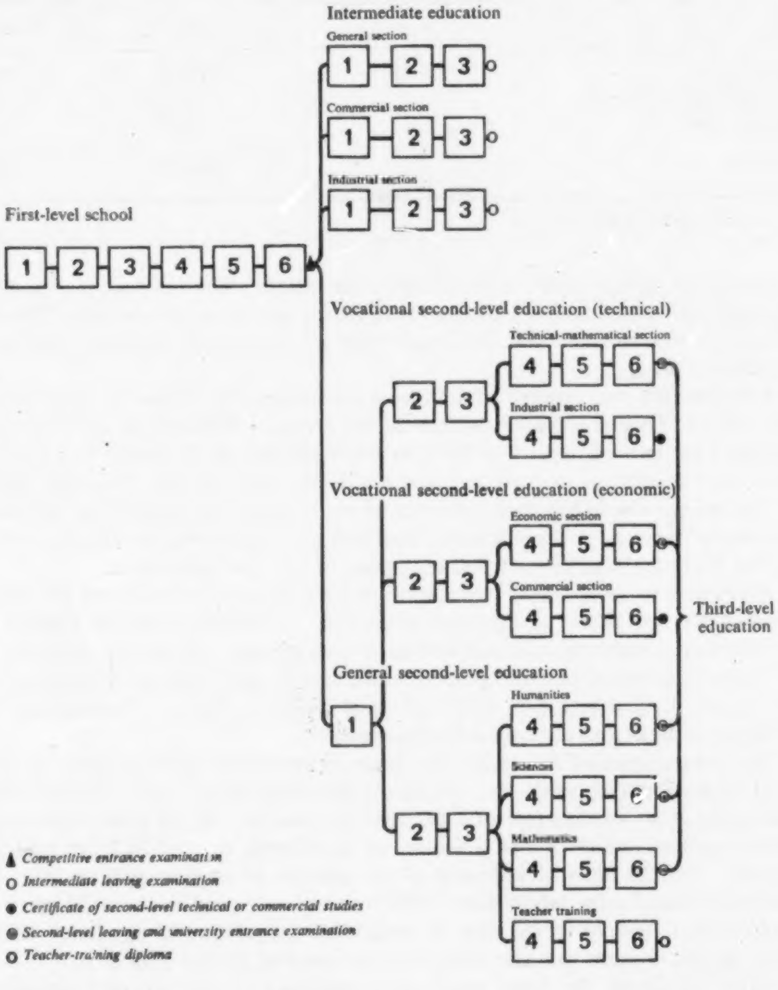
Intermediate education
General section
1
2
3
Commercial section
1
2
3
Industrial section
1
2
3
First-level school
1
2
3
4
5
6
Vocational second-level education (technical)
Technical-mathematical section
4
5
6
2
3
Industrial section
4
5
6
Vocational second-level education (economic)
Economic section
4
5
6
2
3
Commercial section
4
5
6
Third-level education
General second-level education
1
Humanities
4
5
6
Sciences
4
5
6
2
3
Mathematics
4
5
6
Teacher training
4
5
6
▲ Competitive entrance examination
○ Intermediate leaving examination
● Certificate of second-level technical or commercial studies
● Second-level leaving and university entrance examination
○ Teacher-training diploma

FIGURE 1. *The educational system*

Table 9. Trend of first-level enrolments

Year	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70
1	100 044	105 993	119 697	142 322	153 197	164 408	169 776	178 201	169 936	192 241	191 786
new entrants	*70 691*	*73 003*	*80 879*	*93 459*	*106 767*	*115 382*	*119 842*	*128 005*	*117 078*	*144 390*	*137 927*
2	72 501	84 595	95 081	105 159	119 763	128 890	139 458	149 351	154 035	152 904	168 670
3	66 994	74 831	86 262	94 067	106 803	119 930	128 363	138 383	147 474	149 368	153 092
4	53 740	62 505	69 421	77 802	87 842	99 594	110 733	118 996	128 203	131 245	139 653
5	39 129	48 872	57 294	64 280	73 254	83 178	94 448	105 802	115 314	117 333	127 738
6	29 127	31 962	37 822	43 743	52 200	62 766	74 315	86 953	95 833	101 899	119 580
TOTAL	361 535	408 758	465 577	527 373	593 059	658 766	717 093	777 686	810 795	844 990	900 519

SOURCE SEEN

TABLE 10. Forecast and actual first-level enrolments (1959/68-1968/69)

	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69
Forecasts of the ten-year educational plan (new admissions)	75 800	82 325	89 000	95 675	102 350	104 580	112 360	116 820	121 820	129 050
Actual	70 691	73 003	80 879	93 459	106 767	115 382	119 842	128 005	117 078	141 390
Forecasts of the ten-year educational plan (total enrolments)	372 948	428 071	484 961	522 600	577 800	627 100	717 093	738 500	788 200	840 800
Actual	361 535	408 758	465 577	527 373	593 059	658 766	717 093	777 686	810 795	844 990

SOURCE Secrétariat d'Etat au Plan et aux Finances, *Perspectives décenniales de développement, 1962-71*, Tunis 1962
Secrétariat d'Etat au Plan et à l'Economie Nationale, *Statistiques de l'enseignement, année scolaire 1965-66* and *1966-67*, Tunis, 1967 and 1968
Secrétariat d'Etat au Plan et à l'Economie Nationale, *Plan de développement économique et social 1969-72*, Tunis, 1969.

not yet been achieved because of under-estimation of the true population growth; the ten year projection was based on a population growth assumption of an average of 2.1 per cent per annum (with a stabilization of the birth rate as a result of the birth control policy). But, according to the estimates of the population service the true rate moved from 2 per cent around 1956 to 2.6-2.7 per cent around 1966 and 2.8 per cent around 1968. The school-age population was therefore much larger than expected and the target of universal admissions had to be deferred.

Teacher-training policy

There are three levels of qualification for first-level school teachers (certificated teachers, monitors 1 and monitors 2), only the first two of which are given specialized training in teacher-training schools or in the teacher-training sections of lycées and colleges.

Certificated teachers are recruited from pupils who have completed the first cycle of second-level education. They then go on to three years of general education in the second cycle of second-level education (see figure 1) and a supplementary year of teacher training. They are required to serve a probationary year during which they teach half-time and are subject to inspection and regular supervision. Throughout their training they receive a grant to cover their boarding and catering expenses.

Monitors 1 are selected mainly from students with the intermediate school certificate (general section). They then have two years of further schooling, at the end of which they serve a probationary year under the same conditions as certificated teachers.

The Ministry of National Education also recruits graduates of the first cycle of traditional second-level education *(zeitouna)* who, after a probationary year, are confirmed in their appointment.

Finally, the ministry invites applications from all those who are sufficiently qualified, who, after a mid-year or summer training course, serve the usual probationary period under the supervision of inspectors and are then recruited as monitors 2.

This policy of first-level teacher recruitment and training has made it possible to satisfy rapidly growing needs, while at the same time limiting the number of foreign teachers. In 1967/68 foreign teachers [1] amounted to little more than 5 per cent of all first-level teachers, compared with nearly 10 per cent in 1961/62. In ten years, from 1959/60 to 1969/70, the total number of teachers has increased by nearly 12,800 representing an average annual growth rate of nearly 11.9 per cent, which is higher than the growth of total first-level enrolments. The result has been an appreciable fall [2] in the pupil/teacher ratio from 60 to 48 to 1 (see table 11).

[1] Generally education advisers or in charge of districts.

[2] This fall is mainly due to the increase in teaching hours.

TABLE 11. Trend of numbers of first-level school teachers

	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70
Total number	6 155	7 128	7 736	9 253	10 506	11 564	12 862	14 131	15 514	16 194	18 922
of whom foreigners	—	—	750	575	590	597	535	739	740	—	—
Pupil/teacher ratio	59	57	60	58	56	57	56	55	53	52	48

SOURCE SEEN.

TABLE 12. Breakdown of first-level school teachers by category

	1964/65	Percentage	1969/70	Percentage
Teachers	7 789	67.4	12 275	64.9
Monitors 1	1 267	10.9	6 647	35.1
Monitors 2	2 508	21.7		
TOTAL	11 564	100.0	18 922	100.0

SOURCE SEEN.

The breakdown of teachers by level of qualification is shown in table 12. It may be noted that it has very slightly deteriorated since 1964/65, which is in no way surprising, considering the growth of needs over this period. It should also be noted that those classified as ‘ teachers ’ have not all had the same training; in 1967/68 about 36 per cent of them came from teacher-training colleges, 61 per cent had the *tahcil* certificate (traditional education provided at the *zeitouna)* and 3 per cent had the *baccalauréat* or equivalent certificate. If *all* first-level teachers are taken into account, (see appendix, table 5) it will be found that 18 per cent of them have received an education below the standard of the Secondary School Certificate (end of first cycle).

School building

A similar effort has been made in the matter of school building: between 1964/65 and 1967/68, the number of classrooms has increased by 30 per cent (see table 13).

The fall in the pupils/premises ratio is the result of the increase in school hours as well as of changes in the structure of the school pyramid, and correspondingly, the increase (as a percentage of the total) of second to sixth year pupils whose timetable is longer and whose classes are smaller. By way of illustration, in 1966/67, the average size of first-level classes was forty-five in grade 1, forty-two in grade 2 forty in grade 3, thirty-eight in grade 4, thirty-six in grade 5 and thirty-five in grade 6 (IIEP estimate).

Having regard to the hours of teaching per year, the number of classes for each premises and the size of classes it can be taken that each classroom is used about forty hours per week.

Recurrent costs and their financing: unit costs

Between 1961 and 1969 the running costs of first-level education (other than social costs) increased very fast, from 6.5 million dinars to 17.3 million (+166.3 per cent) representing an average growth rate of 13 per cent per annum (see table 14).

TABLE 13. Trend of first-level school premises

	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68
Number of premises	5 342	6 143	6 757	7 661	8 406	9 154	10 148	10 939
Number of pupils	408 758	465 577	527 373	593 059	658 766	717 093	777 686	810 795
Ratio pupils/premises	76.5	75.8	78.0	77.4	78.4	78.3	76.6	74.1

SOURCE *Plan de développement économique et social 1969-72*, op. cit.

TABLE 14. Cost and expenditure of first-level education in Tunisia

	1961	1962	1965	1968	1969
Remuneration of teachers and inspectors	3 895 200	4 322 330	6 046 430	8 720 290	10 957 110
Allowances and social welfare benefits	2 010 470	2 420 090	3 292 020	4 303 860	5 077 580
Pay of pupil-teachers [1]	—	—	242 280	288 560	342 060
Pay of administrative and operative staff (including allowances)	355 400	437 960	441 980	467 280	491 930
Total pay and remuneration	6 261 070	7 180 380	10 022 710	13 779 990	16 868 680
Equipment and material	250 000	252 880	240 000	421 690	470 000
Scholarships, grants and subsidies (including canteens)	60 000	818 920	962 280	1 160 700	1 258 700
Total recurrent costs of first-level education (a) excluding social costs	6 511 070	7 433 260	10 262 710	14 201 680	17 338 680
(b) including social costs	—	8 252 180	11 224 990	15 362 380	18 597 380
Pay of pupil-teachers [1]			242 270	288 560	340 050
Recurrent costs of teacher-training colleges	365 030	388 360	339 000	492 070	721 480
Number of pupils [2]	422 960	481 030	673 350	819 340	858 870
Unit cost:					
excluding social costs	15.39	15.45 } 1.71	15.24 } 1.43	17.33 } 1.41	20.19 } 1.46
including social costs		17.16	16.67	18.74	21.65

[1] This refers to pupil-teachers serving their probationary year, who are required to teach ten to fifteen hours a week (or approximately half-time). We have estimated that half of their pay should be charged against first-level education, the rest being treated as part of the cost of teacher training.

[2] Numbers have been adjusted to the financial year for the sake of comparison with the budget figures.

SOURCE IIEP estimates (breakdown of Ministry of National Education budgets).

This trend results not only from the rise in numbers, which have doubled over the period, but also from the rise in costs, which, after being constant from 1961 to 1965, then rose fairly substantially (+32 per cent in four years), for a number of reasons.

TABLE 15. New salary scales for first-level school teachers

	Teacher	Monitor 1	Monitor 2
Minimum salary	564.2	456.1	396.8
Rate of increase (percentage)	+ 23.7	+ 5.2	+ 7.4
Average salary	948.0	776.9	558.6
Rate of increase (percentage)	+ 22.0	+ 17.1	+ 26.1
Maximum salary	1 212.6	1 036.2	805.2
Rate of increase (percentage)	+ 17.0	+ 26.5	+ 39.2

SOURCE Text of Decree No. 70.203 of 11 June 1970, SEEN.

(a) Changes in timetable for the first two years (twenty-five hours teaching a week, instead of the previous fifteen) and in the sixth year (twenty-seven and half hours a week instead of twenty-five). These changes have meant a rise of 19.0 per cent in unit costs.

(b) Increase in the proportion of enrolments in the third, fourth, fifth and sixth years, with longer teaching hours (increase of 1.7 per cent in unit cost).

(c) Increase in the amount of average benefits and in the average salary per level of qualification, resulting in changes of place in the wage scale (9 per cent increase in unit cost).

Finally, it should be noted that a substantial wage increase was due with effect from 1 October 1970. Table 15 shows the new minimum, average and maximum salaries for each level of qualification and the percentage increase over the old scales.

The salaries of teachers and inspectors, which already amounted to 90.7 per cent of the recurrent costs a first-level education (other than social costs) in 1961 reached 94.5 per cent of the total in 1969. Expenditure on equipment and material remained very low.

The recurrent costs of first-level education are entirely financed from the operating budget of the Ministry of National Education.

Capital expenditure and building costs

Capital expenditures on first-level education (appropriations) has developed as shown in table 16.

TABLE 16. Trend of capital expenditures on first-level education (thousands of dinars)

Year	1963	1964	1965	1966	1967	1968	1969	1970
Expenditure	1 905.4	1 681.0	3 226.8	2 100.0	830.0	700.0	1 087.5	1 070.0

After a period when appropriations grew very fast, cruising speed seems to have been reached around 1967.

First-level school buildings can be divided into two categories:

1. individualized projects designed to meet specific requirements, for which the average building costs are estimated at 3,000 dinars per classroom;
2. so-called ' local authority ' type projects, designed to standard plans, for which the average building costs per classroom are estimated according to region in table 17.

TABLE 17. Average building costs of classrooms and teachers' accommodation (in dinars)

Government	Classes	Accommodation	Government	Classes	Accommodation
Béja	2 300	2 550	Le Kef	1 800	1 800
Bizerta	1 750	2 000	Medenine	2 000	2 400
Gabès	2 000	2 100	Nabeul	2 100	2 000
Gafsa	1 800	2 000	Sfax	1 800	2 200
Jendouba	2 550	2 500	Soussa	1 660	2 047
Kairouan	2 200	2 600	Tunis	2 500	1 850
Kasserine	1 900	2 200			

SOURCE Capital investments in first-level education, Ministry of National Education, Tunis.

Total capital expenditure on first-level education for the period 1969-72 has been determined on these bases, allowing for the regional distribution of the buildings to be erected and the percentage of buildings in the form of individualized projects. The net result is an average building cost per classroom very close to 2,200 dinars.

III The effect of demographic growth on the trend of enrolments and expenditures of first-level education

Projection of the development of first-level education and teacher training in 1979 and 1989

Population growth

The population census of May 1966 shows a total population of the order of 4.5 million, the distribution of which by main age groups is summarized in table 18.

TABLE 18. Distribution of population of Tunisia by major age groups

	0 - 19	20 - 59	60 and above	Total
Numbers	2 480 154	1 799 877	253 320	4 533 351
Percentage of total	54.7	39.7	5.6	100.0

The population projections used in this study have been constructed by the Bureau of the Census, U.S. Department of Commerce [1] on the basis of:

1. the structure by age and sex shown by the census;
2. data on fertility and mortality obtained from the national population survey.

The average number of births has been assessed to be seven per woman. The specific age rates have been adjusted so that they correspond to a crude birth rate for the whole population sufficiently near to the rate indicated by the survey. Life expectancy at birth for men and women has been taken at 49.6 years for men and 55.0 years for women.

Assumptions as to the future trend of population have been based mainly on possible modifications in fertility:

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[1] D.B. Johnson, *Population of Tunisia, estimates and projections, 1967-2000,* Washington, US Bureau of Census, 1971.

ASSUMPTION I (low)

Faster fall in fertility; steady linear fall of 3.5 per cent per annum from the initial level of 1967. Gross reproduction rate falls to 2.02 in 1980. This assumption leads to a crude birth rate of 34 per thousand in 1975, which corresponds to the target set for the Tunisian family-planning programme.

ASSUMPTION II (medium)

Slow fall in fertility; steady linear fall of 2 per cent per annum from the *initial level* of 1967. Gross reproduction rate then falls from 3.70 in 1967 to about 2.74 in 1980.

ASSUMPTION III (high)

Fertility remains at its present level throughout the period of projection. Gross reproduction rate is constant at 3.70 (the level reached in 1967).

The assumptions for the fall in mortality are the same in each of these projections. They are reflected in a constant annual growth of half a year in the life expectancy at birth, which will thus reach the following levels in 1990: men, 60.4 years; women 66.6 years.

The results of these various projections are shown in table 19 and correspond to the numbers in the various age groups on 1st January in the relevant year. For the six-year-old age group, they may therefore be taken to represent, with a very slight error, the number of children to be admitted at 1 October of the preceding year (or three months earlier).

TABLE 19. Population projection in Tunisia 1970-89

	Population		
	Aged 6	Aged 6-11	Total
1970	158 965	895 758	[1]
1979			
Assumption I	167 600	1 027 300	6 338 700
Assumption II	183 300	1 072 300	6 581 500
Assumption III	203 700	1 130 700	6 897 200
1989			
Assumption I	174 600	987 600	7 807 100
Assumption II	239 200	1 308 500	8 742 000
Assumption III	323 300	1 725 600	9 958 200

[1] From 5,213,700 to 5,192,200 according to the assumption.

TABLE 20. Projection of admissions in first-level schools according to population growth assumptions

	Assumption I	Assumption II	Assumption III
1970	150 000	150 000	150 000
1971	163 700	163 700	163 700
1972	171 800	171 800	171 800
1973	177 700	177 700	177.700
1974	174 900	177 600	181 300
1975	172 300	178 000	185 400
1976	170 200	179 000	190 500
1977	168 700	180 800	196 500
1978	167 600	183 300	203 700
1979	167 000	186 600	212 000
1980	166 700	190 400	221 500
1981	166 300	194 800	231 900
1982	165 700	199 400	243 200
1983	164 900	204 100	255 100
1984	163 500	208 800	267 600
1985	161 500	213 400	280 700
1986	159 000	217 800	294 400
1987	166 600	228 300	308 600
1988	174 600	239 200	323 300
1989	182 800	250 400	338 400

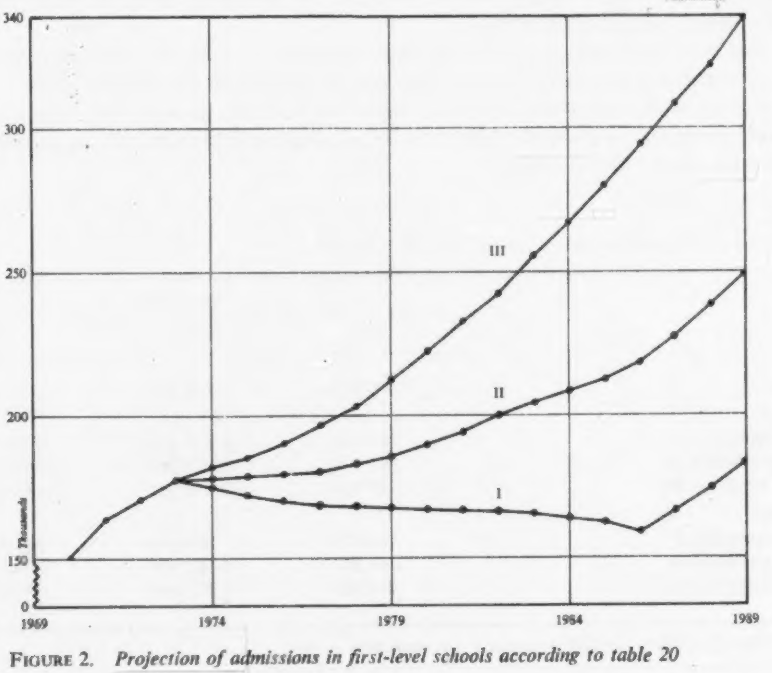

FIGURE 2. *Projection of admissions in first-level schools according to table 20*

Projection of first-level enrolments

Three sets of factors must be taken into account in determining first-level enrolments between now and 1979 and 1989:

1. *The trend in the admission rate for six-year-olds.* We have seen above (see Part II, development of first-level education) that the 1969 admission rate was around 86 or 87 per cent. We will assume that the admission rate of six-years-olds will have reached 100 per cent by 1971/72 (so that admissions should amount to about 164,000 for that school year). See table 20 and figure 2.
2. *The population trend.* Since any effects of a decline in fertility on the birth rate will not be manifest until 1969 onwards, the number of six-year-olds will be the same on any assumption until 1974. It will then continue to grow on assumptions II and III from 1974 to 1989. On assumption I, on the contrary, it will fall from 1974 to 1987 and then start increasing again afterwards.
3. *Possible change in flow rates of the system.* Over the last five or six years the rates of repetition and promotion (see table 21) remained virtually unchanged; it may also be noted that the drop-out rate is in general low, lying between 3 and 6 per cent for the first four grades of first-level education. In these circumstances we have assumed a very limited improvement in flow rate during the first decade, and a slightly larger increase between 1980 and 1990. These changes will be mainly reflected in an increase in the promotion rate and a corresponding fall in the repetition rate, the percentage of drop-out remaining practically unchanged, except at the end of the fifth grade.

Special attention has been paid to what happens at the end of the sixth grade. The measures recently taken in the field of second-level education will lead to a decline in admissions, with the results that in a first phase the percentage of repeaters and of drop-outs (representing in fact, all those who terminate their schooling at the end of first-level school) will tend to increase. In the medium and long-term, the repetition rate should fall, while the number of children terminating their studies at the end of first-level education will go on increasing.

In the light of all these assumptions, we have made projections of enrolments for 1979 and 1989. The results are shown in table 22 and figure 3.

The impact of population growth on first-level enrolments is obviously more marked in 1989. It may also be noted that the difference between enrolments under assumption I and assumtion III is of the order of 65 per cent in 1989 compared with less than 8 per cent in 1979. The long term effects of the family-planning policy are therefore likely to be particularly noticeable.

It should also be added that the very high repetition rate in the last year of first-level education will lead, in 1989, to a somewhat unusual pyramid of enrolments in which there are more pupils in the sixth grade than in the fifth (except on the high population growth assumption).

TABLE 21. Trend of promotion, repetition and drop-out rates in first-level education (per thousand)

	1st year			2nd year			3rd year			4th year			5th year			6th year		
	P	R	D	P	R	D	P	R	D	P	R	D	P	R	D	P	R	D
Average 1964-68	670	300	30	750	220	30	688	270	42	654	286	60	556	354	90	410	430	160
Average 1970	670	300	30	750	220	30	688	270	42	654	286	60	556	354	90	340	460	200
Average 1980	680	290	30	760	210	30	700	260	40	660	280	60	580	340	80	300	410	290
Average 1990	710	260	30	790	180	30	730	230	40	690	250	60	630	310	60	300	400	300

TABLE 22. Projection of first-level enrolments according to population growth assumptions

	1969	1979			1989		
		Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
1st year	192 241	240 900	261 240	287 660	232 740	318 590	430 360
2nd year	152 904	209 610	221 740	237 500	193 050	262 810	353 600
3rd year	149 368	218 630	225 930	235 460	196 450	260 840	344 570
4th year	131 245	211 350	214 340	218 300	195 500	248 090	316 400
5th year	117 333	207 550	208 170	209 010	199 540	242 290	294 210
6th year	101 899	187 390	187 390	187 390	212 210	246 380	293 070
TOTAL	844 990	1 275 430	1 318 810	1 375 320	1 229 490	1 579 000	2 032 210

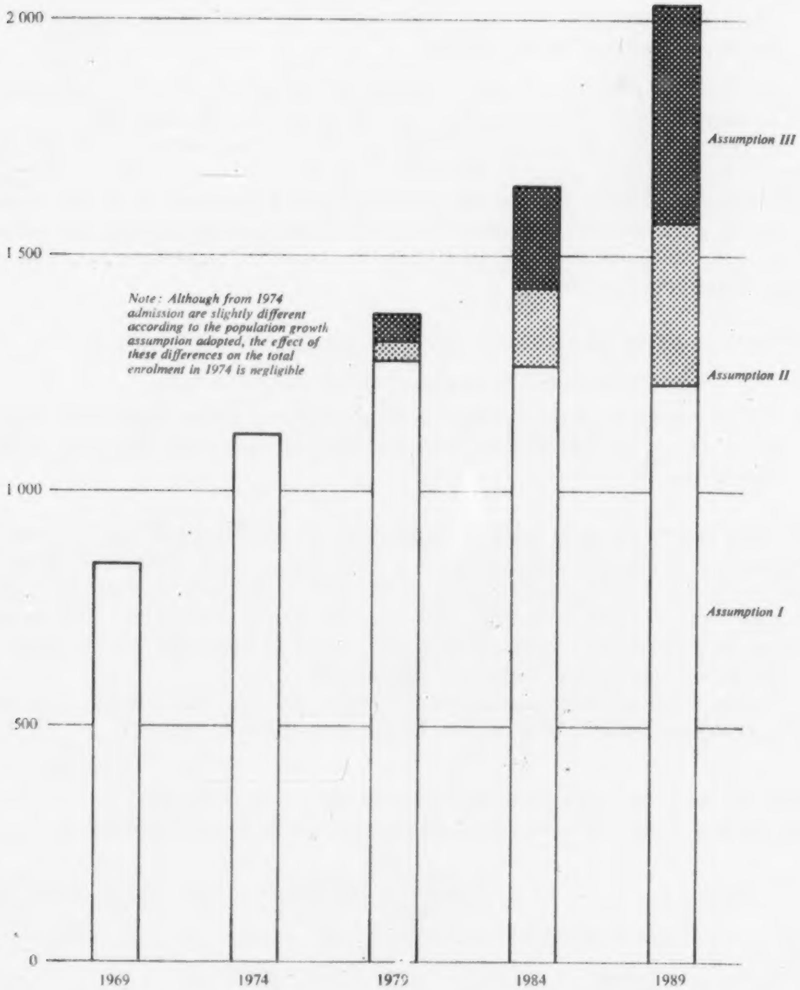

FIGURE 3. *Projection of first-level enrolments according to population growth assumptions*

Projection of the number of teachers

Two sets of assumptions must be made in order to determine the future trend of the stock of teachers and their distribution by qualification:

1. The first relates to possible changes in the pupil/teacher ratio, which itself depends on the size of classes, the number of hours taught at each level of first-level education and the teaching load per teacher;

2. The second relates to the policy followed by the Tunisian government in the matter of qualifications of teachers.

Over the last ten years, the size of classes has varied very little and fluctuated, on average, around forty, as we have seen above (see Part II, page 249).

We have adopted the same characteristics for our projections, except for the fifth and sixth grade, where we have taken an average class size of thirty-eight.

With regard to teaching hours, the present position is as follows: first year, fifteen hours per week; second, third, fourth and fifth years, twenty-five hours per week; sixth year, twenty-seven and a half hours per week. Teachers are required to teach thirty hours per week.

For 1979 and 1989 we have adopted two assumptions for teaching hours:

1. The first corresponds to the present situation, assumption A.
2. The second provides for an increase in the number of hours taught, (twenty-five hours a week for the first two years and thirty hours for the following years), assumption B.

We have also allowed for a slight improvement in teacher qualifications, mainly reflected in the disappearance of monitors 2 between now and 1989, while the proportion of certificated teachers and of monitors 1 will tend to increase. The changes which we have assumed are of relatively minor importance. The cost of major improvements in qualification would indeed be very high, (the differences between the various salary scales are substantial).

This assumption has been combined with those relating to the number of hours of teaching per grade to give the two alternatives shown in table 23.

TABLE 23. Assumptions relating to teaching hours and teacher qualifications

		1979		1989	
		Assumption A (hours)	Assumption B (hours)	Assumption A (hours)	Assumption B (hours)
Teaching hours	1st year	15	25	15	25
	2nd year	25	25	25	25
	3rd year	25	30	25	30
	4th year	25	30	25	30
	5th year	25	30	25	30
	6th year	27.30	30	27.30	30
		(percentage)	(percentage)	(percentage)	(percentage)
Teacher qualifications	Certificated teacher	70	70	75	75
	Monitors 1	20	20	25	25
	Monitors 2	10	10	—	—

TABLE 24. Projection of teacher requirements according to different population growth and teaching hours assumptions

	1979			1989		
	Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
Assumption A	25 090	25 800	26 730	24 280	30 890	39 430
Assumption B	30 040	30 940	32 090	29 020	37 030	47 370

TABLE 25. Projection of the required number of teachers by qualification according to different population growth and teaching hours assumptions

		1979			1989		
		Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
Assumption A	Certificated teachers	17 560	18 060	18 710	18 210	23 170	29 570
	Monitors 1	5 020	5 160	5 350	6 070	7 720	9 860
	Monitors 2	2 510	2 580	2 670	—	—	—
Assumption B	Certificated teachers	21 030	21 660	22 460	21 770	27 770	35 530
	Monitors 1	6 010	6 190	6 420	7 250	9 260	11 840
	Monitors 2	3 000	3 090	3 210	—	—	—

The needs for teacher in 1979 and 1989 and their distribution by qualification are shown in tables 24 and 25, while the trend of the stock of teachers in the various population growth assumptions is shown in figure 4.

Projection of teacher-training college enrolments

The projections must be made in two steps. We must first determine the additional number of qualified teachers needed, (certificated teachers and monitors 1). We assume that these are the only categories trained in teacher-training colleges. On the basis of annual needs, the next step is to determine the enrolment in teacher-training colleges which will meet these needs, using the existing ratios between enrolments at each level and the annual output.

The additional number of teachers needed each year can be estimated from the wastage of the existing stock of teachers, and from the new needs arising out of the increase in enrolments, changes in the pupil/teacher ratio and improved teacher qualifications.

The annual wastage of teachers has been estimated on the basis of their distribution by age group as shown by the 1966 census (see table 26).

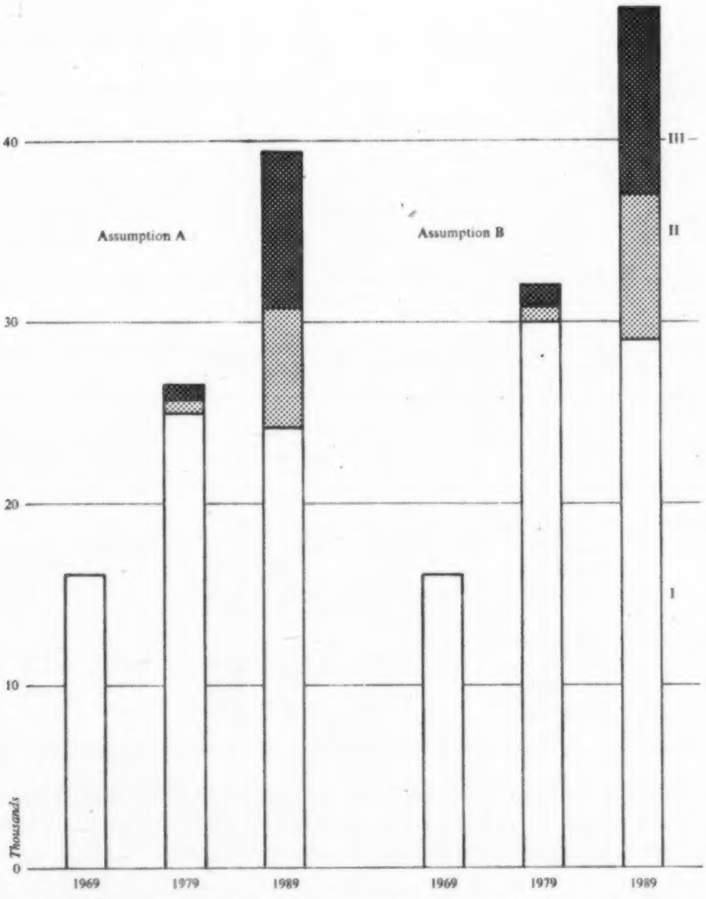

FIGURE 4. *Projection of the required number of teachers by qualification according to population growth assumptions and teaching hours assumptions*

This distribution has been updated for 1970 by estimating the number of new teachers in each age group and assuming that virtually all new teachers trained between 1966 and 1970 are between 20 and 24. We have then estimated for each of the decades 1970-79 and 1980-89 the number of teachers retiring and the number of deaths in each age group. In making this last assessment we have taken account of the number of new teachers trained in each period and we have applied the mortality rate of the whole population to each five-year age group.

Overall, it appears that wastage through death and retirement will be relatively slight over the next two decades, owing to the comparative youth of the teaching force, due to the very recent development of first-level education. Nevertheless, allowing for wastage due to people leaving the profession, it can be estimated that

Table 26. Breakdown of teachers by age in 1966

Age	School teachers	Monitors
15-19	230	382
20-24	2 342	1 694
25-29	2 290	838
30-34	2 187	521
35-39	1 466	343
40-44	648	142
45-49	452	77
50-54	254	67
55-59	182	25
60-64	84	27
Total	10 135	4 116

Table 27. Number of additional teachers to be trained

		1979			1989		
		Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
Assumption A	School teachers	470	700	1 010	450	1 070	1 870
	Monitors 1	130	200	290	150	360	620
Assumption B	School teachers	550	840	1 220	560	1 300	2 260
	Monitors 1	160	240	350	190	430	750

the annual replacement needs will amount to about 2 per cent of the teacher stock.

Once the replacement needs are determined, one can calculate the number of additional teachers to be trained each year on the basis of the existing stock in 1969-70 and the stocks required in 1979 and 1989. The results are shown in table 27.

It will be seen that the needs for new teachers in a given year are very variable, according to the population assumption on the one hand, and the assumptions as to teaching hours and qualifications on the other.

We next have to determine the enrolment in teacher-training colleges which will make it possible to satisfy these teacher requirements. For this purpose we have used flow rates calculated from the data on output of teacher-training colleges given in the Four-year Plan 1965-68.

The results of these calculations are shown in table 28.

Projection of classroom requirements

Annual needs for classrooms can be divided into replacement needs and new needs. For replacements we have assumed that it will be equivalent to 2 per cent

TABLE 28. Teacher-training colleges enrolments

		1979			1989		
		Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
Assumption A	Certificated teachers	1 750	3 040	4 860	2 540	5 110	8 760
	Monitors 1	240	420	650	390	820	1 400
Assumption B	Certificated teachers	2 160	3 620	5 840	3 060	6 220	10 530
	Monitors 1	310	520	800	470	980	1 690

of the stock.[1] New buildings are, moreover, related to the increase in enrolments, and changes in teaching hours at each level, in the light of the average use of premises. In this connexion, a retrospective study has been made on the basis of:

(a) the number of classrooms;

(b) the number of classes for each grade;

(c) the number of hours taught in each grade.

The total number of hours taught per week is calculated from (b) and (c). The average number of hours per week during which classrooms are used is thus calculated by dividing the total number of hours taught by the number of classrooms. This average has been remarkably stable over the last few years at about forty hours. We have taken this figure for the projections.

To determine the classroom requirements for 1979 and 1989 we have assessed the number of classes per grade and applied the corresponding timetables in order to estimate the total number of hours per week; dividing by the average number of hours of use, we get the number of classrooms needed (see table 29).

TABLE 29. Number of classrooms needed in 1979 and 1989

	1979			1989		
	Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
Assumption A	18 820	19 350	20 050	18 210	23 170	29 570
Assumption B	22 530	23 210	24 070	21 770	27 770	35 530

Allowing for the annual increases in enrolments and replacement needs, the number of additional classrooms to be built in 1979 and 1989 can then be estimated (see table 30).

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[1] This hypothesis may correspond to an over-estimation of replacement needs because a large proportion of the buildings are relatively new.

TABLE 30. Number of classrooms to be built in 1979 and 1989

	1979			1989		
	Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
Assumption A	480	760	1 080	450	1 070	1 870
Assumption B	550	900	1 300	570	1 300	2 260

Projection of the cost of first-level education and teacher training

Cost of first-level education

We shall consider recurrent costs and capital costs successively.

RECURRENT COSTS

Salary costs of teachers and supervisors

To obtain a precise figure for the total cost of teachers' salaries in 1979 and 1989 one has to take into account the salary scale and therefore one has to know not only the level of qualification but also the distribution of teachers by length of service.

This projection requires two sets of data:

1. the present distribution of teachers by length of service for each category;
2. the proportion of unestablished teachers in each category[1] (unestablished teachers are paid the minimum salary on their scale).

Since these data were unfortunately not available, we have proceeded by applying to the stock of teachers in each category the average salary for their scale[2] taking benefits into account. We have also assumed that the average salary will increase in the same proportion as the GNP per head of working-age population between now and 1979 and 1989.

Since teacher's salaries amounted in 1968 to about 94 per cent of the recurrent costs of first-level education (not including social costs) these future trends will have a decisive influence on the trend of total expenditure.

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[1] And the factors of development of this category of teachers.

[2] This method is likely to overestimate slightly the total salary in the event of a rapid growth of the number of teachers, which would result in a certain reduction of the average length of service of teachers, so that their average salary is below the median of the scale. The converse would happen if the numbers of teachers increased slowly.

A particular difficulty was found in the choice of the salary to be taken as a starting point for our projection because of the salary increase in October 1970. It was not possible to take either the old salary scale or the new one. The first would correspond to a low point and the second to a high point on the salary trend curve. That is why, we have taken an intermediate value, which is fictitious but with which it is possible to project salaries from a mid-point of the salary curve. Although this method allows for a reasonable extrapolation, it makes it more difficult to assess the increase in recurrent expenditures of first-level education from 1969 to 1989.

The table 31 shows the new values of the minimum, average and maximum salary for each category of teachers.

Two assumptions have been made on economic growth between 1970 and 1989:

1. average growth of 4 per cent per annum in GNP over the two decades, corresponding to the simple continuation of past trends;
2. average growth of 5 per cent per annum, representing a certain speeding up of growth.

TABLE 31. Salary scales of teachers in first-level schools (October 1970)

	School teachers (In dinars)	Monitors 1 (In dinars)	Monitors 2 (In dinars)
Minimum salary	564.2	456.1	396.8
Average salary	948.0	776.9	558.6
Maximum salary	1 212.6	1 036.2	805.2

Other recurrent costs

The unit cost for all this expenditure amounted to 2.6 dinars in 1969. We have assumed that it might increase by 1 per cent per annum. (See table 32.)

TABLE 32. Projections of other recurrent expenditure (thousands of dinars)

	1979			1989		
	Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
Other recurrent expenditure	3 660	3 785	3 947	3 898	5 005	6 442

CAPITAL EXPENDITURES

In our projections of school building, we have taken an average cost per classroom of 2,300 dinars, slightly higher than that of recent years owing to the expected

TABLE 33. Equipment costs

	Standards	Unit cost
Sanitary blocks	1 block per classroom	360 dinars
Material and equipment	per classroom	300 dinars

increase in the cost of ' individualised premises ' (which is expected to go up from 3,000 to 3,500 dinars). The incidence on the average cost is, however, relatively low owing to the limited proportion of these buildings in the total (5 per cent). We have also assumed that each classroom will have the normal equipment and a sanitary block, which has not always been the case up to now.

The costs and standards adopted for the projection of capital expenditures are summed up in table 33. The cost of a classroom projected on this basis will therefore be 2,960 dinars. Capital expenditures estimated on the basis of these different assumptions are shown in table 34.

TABLE 34. Projection of capital expenditures in first-level education (thousands of dinars)

	1979			1989		
	Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
Assumption A	1 421	2 250	3 197	1 332	3 167	5 535
Assumption B	1 628	2 664	3 848	1 687	3 848	6 690

Teacher training

RECURRENT EXPENDITURES

Unit costs in teacher-training schools, as ascertained from the analysis of the budgets of certain establishments, are much the same as those of general second-level education (slightly higher than 100 dinars) but allowance must also be made for the grants given to each student-teacher amounting to twenty-five dinars a term and intended to cover boarding and catering expenses. The projections for this item are given in table 35.

CAPITAL EXPENDITURES

We have made no specific estimate for this expenditure, since future enrolments in teacher-training schools should not appreciably exceed the present figure (see table 27) whatever the assumption made. There is therefore no need to increase existing capacities.

TABLE 35. Recurrent expenditure for teacher-training colleges (thousands of dinars)

	1979			1989		
	Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
Assumption A						
GNP 4 per cent	358	623	992	557	1 127	1 930
GNP 5 per cent	388	675	1 074	659	1 334	2 286
Assumption B						
GNP 4 per cent	445	745	1 123	671	1 368	2 322
GNP 5 per cent	482	807	1 295	794	1 620	2 750

Total cost

Total recurrent and capital expenditures on first-level education and teacher training were then calculated for each assumption. The results are shown in tables 36 and 37. According to the hypotheses adopted, the increase in recurrent costs may be very different from 1969 to 1989. These costs may be multiplied by coefficients which range from 1.9 to 4.4 (see table 38). While population growth accounts for a substantial part of this increase other factors such as the improvement of the pupil/teacher ratio, improved teacher qualifications and pay increases, also play a decisive part.

In order to study the trend of expenditure on first-level education on the different assumptions adopted, it is also possible to determine what proportion of GNP will be devoted to it in 1979 and 1989. The results are shown in table 39. They can be analysed by comparison with 1969, in which year first-level education absorbed 3.66 per cent of GNP.

This percentage is already relatively high (compared with the level attained in other countries); it is explained by three main characteristics of the Tunisian first-level education system:

1. a relatively advanced situation in the matter of enrolment ratios; fairly high repeating rates, especially towards the end of first-level education;
2. salaries which, in terms of GNP per capita, are fairly high.[1]

Even on the low population growth assumption, the percentage of GNP devoted to expenditures on first-level education in 1979 should increase: this increase will not be very great if the teaching hours do not change (which will allow the pupil/teacher ratio to be maintained at almost the same level as at the present time), but it will become sizeable if the hours increase. It should be added that faster economic growth would lead only marginally to a reduction in the percentage of this expenditure related to GNP. As a result of the assumptions we have

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[1] This characteristic is found in a great many other developing countries.

TABLE 36. Projection of expenditures on first-level education and teacher training, growth assumption 4 per cent of GNP (thousands of dinars)

		1979			1989		
		Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
Assump. A	*First-level education*						
	Recurr. exp.	33 838	34 817	36 098	36 482	46 459	59 357
	Capital exp.	1 421	2 250	3 197	1 332	3 167	5 535
	TOTAL	35 259	37 067	39 295	37 814	49 626	64 892
	Teacher training						
	Recurr. exp.	358	623	992	557	1 127	1 930
	GRAND TOTAL	35 617	37 690	40 287	38 371	50 753	66 822
Assump. B	*First-level education*						
	Recurr. exp.	39 792	41 000	42 545	42 843	54 699	70 012
	Capital exp.	1 628	2 664	3 848	1 687	3 848	6 690
	TOTAL	41 420	43 664	46 393	44 530	58 547	76 702
	Teacher training						
	Recurr. exp.	445	745	1 123	671	1 368	2 322
	GRAND TOTAL	41 865	44 409	47 516	45 201	59 915	79 024

TABLE 37. Projection of expenditures on first-level education and teacher training, growth assumption 5 per cent of GNP (thousands of dinars)

		1979			1989		
		Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
Assump. A	*First-level education*						
	Recurr. exp.	36 859	37 884	39 316	43 402	55 263	70 595
	Capital exp.	1 421	2 250	3 197	1 332	3 167	5 535
	TOTAL	38 280	40 134	42 513	44 734	58 430	76 130
	Teacher training						
	Recurr. exp.	388	675	1 074	659	1 334	2 286
	GRAND TOTAL	38 668	40 809	43 587	45 393	59 764	78 416
Assump. B	*First-level education*						
	Recurr. exp.	43 409	44 725	46 408	51 114	65 253	83 513
	Capital exp.	1 628	2 664	3 848	1 687	3 848	6 690
	TOTAL	45 037	47 389	50 256	52 801	69 101	90 203
	Teacher training						
	Recurr. exp.	482	807	1 295	794	1 620	2 750
	GRAND TOTAL	45 519	48 196	51 551	53 595	70 721	92 953

TABLE 38. Increase coefficients of recurrent expenditures on first-level education (1969-89)

	4 per cent growth in GNP			5 per cent growth in GNP		
	Ass. I	Ass. II	Ass. III	Ass. I	Ass. II	Ass. III
Assumption A	1.926	2.453	3.134	2.292	2.918	3.727
Assumption B	2.262	2.888	3.697	2.699	3.445	4.409

TABLE 39. Total expenditure on first-level education [1] as percentage of GNP

	1979			1989		
	Ass. I (percentage)	Ass. II (percentage)	Ass. III (percentage)	Ass. I (percentage)	Ass. II (percentage)	Ass. III (percentage)
Growth rate 4 per cent of GNP						
Assumption A	4.03	4.27	4.56	2.93	3.88	5.11
Assumption B	4.74	5.03	5.38	3.46	4.58	6.04
Growth rate 5 per cent of GNP						
Assumption A	3.97	4.19	4.48	2.87	3.77	4.95
Assumption B	4.68	4.95	5.30	3.38	4.47	5.87

[1] Including teacher training.

adopted about average salaries, according to which they will increase at the same rate as the GNP per working-age population, the share of total first-level education [1] expenditures in total GNP will not change significantly if, *ceteris paribus*, the economic growth is faster. This effect is different from the one described in the following paragraph, where, for the same rate of economic growth, total teachers' salaries are compared according to various demographic assumptions, i.e. according to the number of children to be enrolled.

While the results are relatively closely grouped in 1979, a substantial dispersion appears in 1989, following the much greater effect which population growth may have at an interval of twenty years.

Furthermore, on looking at the trend of the percentage of GNP devoted to expenditure on first-level education between 1979 and 1989, it will be found that there is a steady increase in the high population growth assumption, whereas there is a fall on the other two assumptions. These variations are mainly linked with the increase in enrolments during the second decade. Depending on the trend of fertility they could increase by 47.8 per cent or 19.7 per cent or even fall by 3.6 per cent. As the working-age population is appreciably the same in 1989 whatever the assumption adopted, the growth of GNP per head of active population up to that date is independent of the demographic trend.[1] In these circumstances teachers' pay will have the same value whatever the population growth, so that the differences which appear in 1989 in the level of educational expenditures are due solely to the increase in enrolments.

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[1] In which teacher salaries take a very large share.

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[1] It depends only on the rate of economic growth.

Conclusion

We have tried in this study to show how expenditure on first-level education might evolve in the light of population growth, assuming that there is no change in educational technology. We have introduced various sets of assumptions concerning the number of hours taught in various grades, the work load of teachers, teachers' qualifications and pay increases. Each of these factors obviously influences the growth of educational expenditures and it is useful, if not to isolate the exact share of each of them, at least to bring out the comparative importance of their trends. For this purpose we have calculated the increase coefficients between 1969 and 1989, of each of these components (see table 40).

It is to be noted that it is not possible to measure the total increase in expenditures with the increase coefficients of the various components because of two reasons:

(a) these coefficients are only related to salary expenditures;

TABLE 40. Increase coefficients of the various components in the growth of recurrent expenditure of first-level education (1969-89)

	Assumption I	Assumption II	Assumption III
Population growth	1.454	1.868	2.404
Improvement of pupil/teacher ratio			
Assumption A	1.031	1.021	1.013
Assumption B	1.232	1.224	1.216
Salary increase			
Growth assumption 4 per cent of GNP	1.140	1.140	1.140
Growth assumption 5 per cent of GNP	1.382	1.382	1.382
Improved teacher qualification			
Growth assumption 4 per cent of GNP	1.064	1.064	1.064
Growth assumption 5 per cent of GNP	1.064	1.064	1.064

(b) The method of projection of salary level (see p. 266) uses, as a starting point, a value which does not correspond exactly to the salary scale in 1969. The increase coefficient indicated in table 40 refers thus to the increase in salary in 1989 as compared to the fictitious average scale adopted as a basis for our projection.

The analysis of the results shows that the population factor is always dominant even in the low population growth assumption. No other component increases in the same proportion. Furthermore, the differential effect of population growth becomes very substantial in 1989.

Changes in teaching hours are measured in terms of the pupil/teacher ratio. Two comments can be made on this subject:

1. Even on assumption A in which the hours taught are unchanged from the present situation, a very limited effect of increase is found. This is due to the fact that the structure of the pyramid of enrolments by grade will tend to change. The *percentage* of pupils in the second, third, fourth, fifth and sixth years will increase in proportion as the flow spreads through the system, and since the number of hours taught in these years is higher than in the first grade there will be a slight increase in the pupil/teacher ratio.
2. The increase in this ratio also varies according to the population assumption. This effect is very close to that noted in the preceding comment. According to the speed and nature of population growth, the school pyramid changes at varying speed, thus affecting the pupil/teacher ratio, since teaching hours are not identical for each grade.

Salary increases have a much greater impact under the assumption that GNP increases by 5 per cent per annum. In fact, as we have seen above, the working-age population in 1989 is practically the same in the three demographic assumptions so that the increase in GNP per head of working-age population depends solely on the trend of GNP. The variation in growth of 1 per cent over 20 years therefore explains the difference in the level of salaries.

Finally, it should be noted that the improved qualification of teachers will have a relatively limited effect in increasing educational expenditures. This is explained by the fact that the percentage of teachers considered to be qualified[1] is already relatively high, so that changes in the pattern of qualifications will have only a marginal effect on the increase in average salaries for all qualifications.

The study finally leads to a ranking in diminishing order of sensitivity of the different factors which contribute to the trend of first-level educational expenditure. In the event of high population growth, and if it proved difficult to finance the expenditure involved, the foregoing analysis would make it possible to identify the factors in respect of which action might be envisaged. These factors are, however, not independent of each other and a deterioration in teacher qualifications or pupil/teacher ratio might result in a certain increase in the repetition rate and therefore in a slightly bigger increase in enrolments than forecast.

---

[1] Certificated teachers and monitors 1.

Appendix

TABLE 1. Trend of gross fixed capital formation, current prices (millions of dinars)

	1960	1965	1969	1970[1]
Productive investments	—	97.5	93.0	109.8
Public investment, housing and miscellaneous	—	34.8	42.3	35.6
Total gross fixed capital formation	59.5	132.3	135.3	145.4

1. *Rapport sur le budget économique de l'année 1971*, op. cit.

TABLE 2. Summary of income and outlay account of general government, current prices (millions of dinars)

	1960	1965	1969	1970[1]
Current revenue	83.4	122.5	176.4	188.3
Current expenditure	71.0	101.7	155.5	172.4
Saving	12.4	20.8	20.9	15.9
Saving as percentage of GDP	3.7	4.2	3.4	2.4

1. *Rapport sur le budget économique de l'année 1971*, op. cit.

TABLE 3. Capital account of the nation, current prices (millions of dinars)

	1960	1965	1969	1970[1]
Capital needs				
(gross fixed capital formation + variations in stocks + variations in foreign currency reserves)	49.1	134.7	151.9	157.4
Resources				
National saving	24.1	57.5	89.9	90.4
of which: general government	*12.4*	*20.8*	*20.5*	*15.8*
enterprises	*7.6*	*29.2*	*62.3*	*67.1*
households	*4.1*	*7.5*	*7.1*	*7.5*
Net external flow	25.0	77.2	62.0	67.0

1. *Rapport sur le budget économique de l'année 1971*, op. cit.

TABLE 4. Capital account of general government (resources), current prices (millions of dinars)

	1960	1965	1969	1970[1]
Saving	12.4	20.8	20.9	15.9
External resources	15.1	35.5	48.4	60.8
Internal resources	12.6	17.6	17.0	13.6
of which borrowing and cost transitions	*12.6*	*16.8*	*16.2*	*12.5*
TOTAL	40.1	73.9	86.3	90.3

[1] *Rapport sur le budget économique de l'année 1971*, op. cit.

TABLE 5. Breakdown of teaching staff by level of education and nationality

Level of education	1963/64			1967/68		
	Tunisian	Foreign	Total	Tunisian	Foreign	Total
Teacher-training certificate	1 598	106	1 704	3 133	116	3 249
Full *Bac.* D.F.E.S. Sadiki D.S. Arab	234	369	603	271	549	820
Probationary *Bac.* or former 1st part of *Bac.*	4 951	3	4 954	933	25	958
Tahcil	291	35	326	5 285	1	5 286
B.E.E.S. or equivalent	1 248	53	1 301	2 050	41	2 091
Below B.E.E.S. level	1 594	24	1 618	2 802	8	2 810
TOTAL	9 916	590	10 506	14 474	740	15 214

SOURCE *Statistiques de l'enseignement, année scolaire 1965/66* and *1966/67*, op. cit.

Model

showing the effect of demographic growth on the development and cost of first-level enrolment and teacher training

Ta Ngoc Châu

Contents

Introduction 281

I. Basic equations of the model 286

New admissions 286
Total enrolment in first-level education 288
Number of teachers required 292
Additional number of teachers 293
Enrolment in teacher training 295
Number of new classrooms required 297
Recurrent costs of first-level education 298
Capital cost of first-level education 299
Recurrent cost of teacher training 300
Recapitulation of the equations and the variables 301

II. Change in the variables from the base year to the horizon year 304

Change in the number of new admissions 304
Change in the total enrolment of first-level education 305
Change in the recurrent costs of first-level education 307

Appendix 311

Introduction

This is essentially a projection model. Its aims are neither to predict what may be the probable level of future expenditures nor to show what could be the development of first-level education taking into account population growth. It aims only to show the sensitiveness of educational expenditures to various population projections when such or such a policy is implemented.

It has been prepared principally for educational planners and in its presentation we have tried to be as simple as possible. We have also tried to adapt it to data which are generally available or which can be processed easily. It is mainly oriented towards developing countries, where an often rapid population growth makes certain educational targets, such as universal first-level education, difficult to achieve, while at the same time it is necessary to improve the existing standard of this level of education.

Demographic growth certainly plays an important part in the future increase of educational expenditures. Its effects, however, are combined with other factors of cost increase, factors which are linked for instance to the necessity of improving the present standard of education. In the projection of expenditures it is necessary, therefore, to take into account assumptions concerning not only the trend of population growth but also hypotheses concerning the change of certain variables which we have called policy variables and which are, for instance: the admission rate into the system; the retention rates in the system; the qualification profile of the teaching force; the teacher/pupil ratio; etc. It is also necessary to take into account certain exogenous variables such as the change in the salary scale of the different grades of teachers, the change in building costs, etc.

In the first part of the model we have therefore tried to establish a series of basic equations which indicate the various steps in the projection and which may be used as a convenient computation tool to estimate the range of possible costs according to various sets of hypotheses concerning the change of policy variables and of exogenous variables.

It is also interesting, on the other hand, to isolate the various factors of cost increase and to show their relative share in the increase of total cost. This is why, in the second part of the model, we have tried to show how it may be used to compare the base year with the horizon year and to isolate the increase which can be imputed to each factor.

It is to be noted that since retention rates and likewise costs are often very different between urban and rural areas, it is better to project the populations of these areas separately, taking into account both the rate of natural growth and the effects of migration and to use the model separately for each area.

If the situation warrants it, and if statistical data are available, the exercise can also be done for more than two sub-populations.

A schematic and simplified presentation of the model is given in figures 1 to 3.

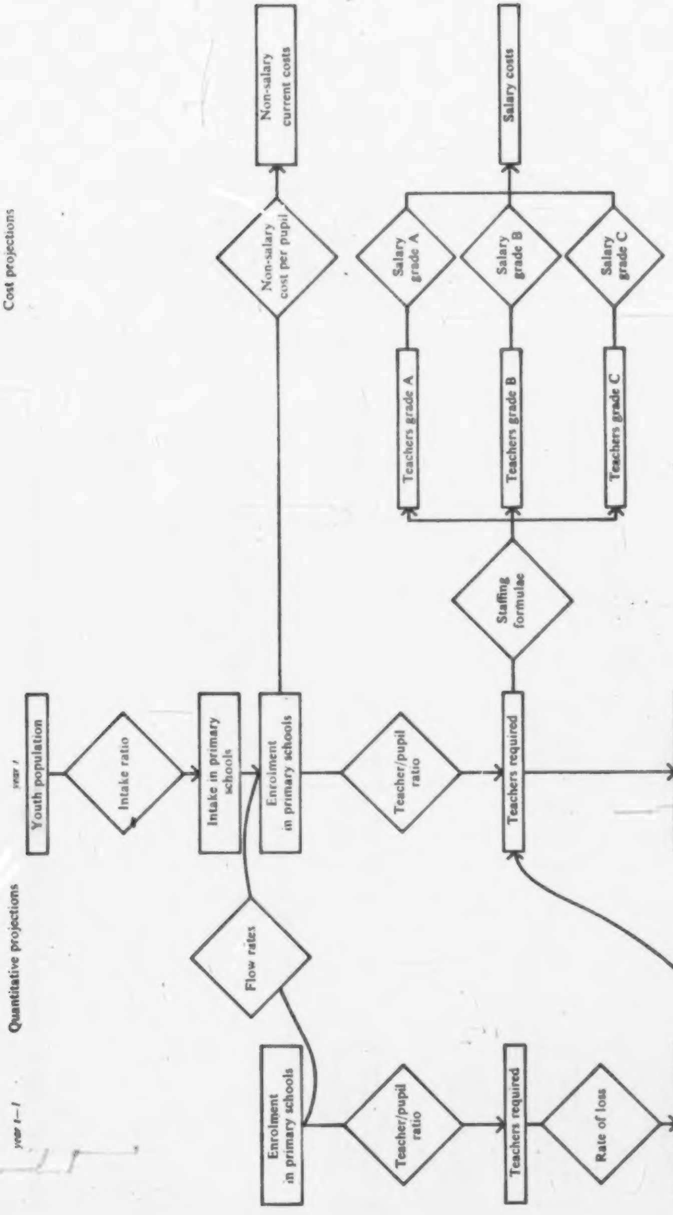
Quantitative projections
Cost projections
year t−1
year t
Youth population
Intake ratio
Intake in primary schools
Enrolment in primary schools
Flow rates
Enrolment in primary schools
Teacher/pupil ratio
Teachers required
Rate of loss
Teachers available for next year
Teacher/pupil ratio
Teachers required
Additional teachers required
Staffing formulae
Teachers grade A
Teachers grade B
Teachers grade C
Salary grade A
Salary grade B
Salary grade C
Salary costs
Non-salary cost per pupil
Non-salary current costs

FIGURE 1. *The functioning of the model: (a) projection of recurrent cost of first-level education*

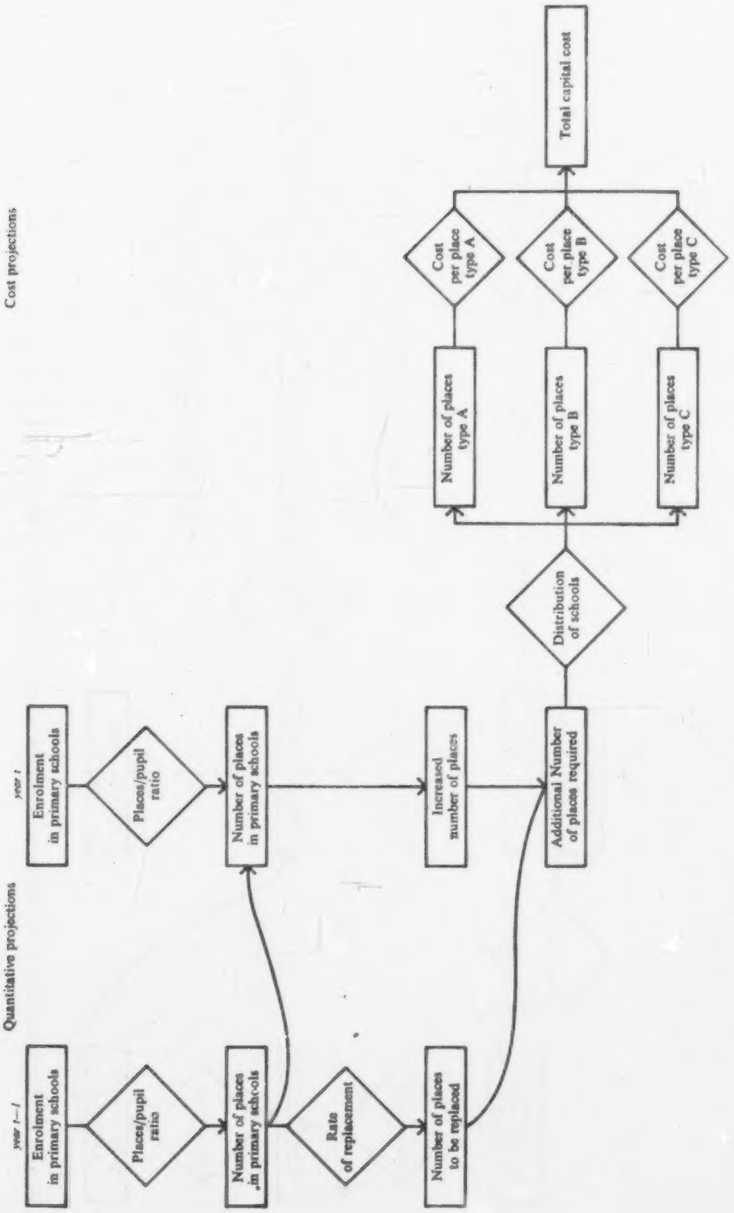
Quantitative projections
Cost projections
year t–1
Enrolment in primary schools
Places/pupil ratio
Number of places in primary schools
Rate of replacement
Number of places to be replaced
year t
Enrolment in primary schools
Places/pupil ratio
Number of places in primary schools
Increased number of places
Additional Number of places required
Distribution of schools
Number of places type A
Number of places type B
Number of places type C
Cost per place type A
Cost per place type B
Cost per place type C
Total capital cost

FIGURE 2. *The functioning of the model: (b) projection of capital cost of first-level education*

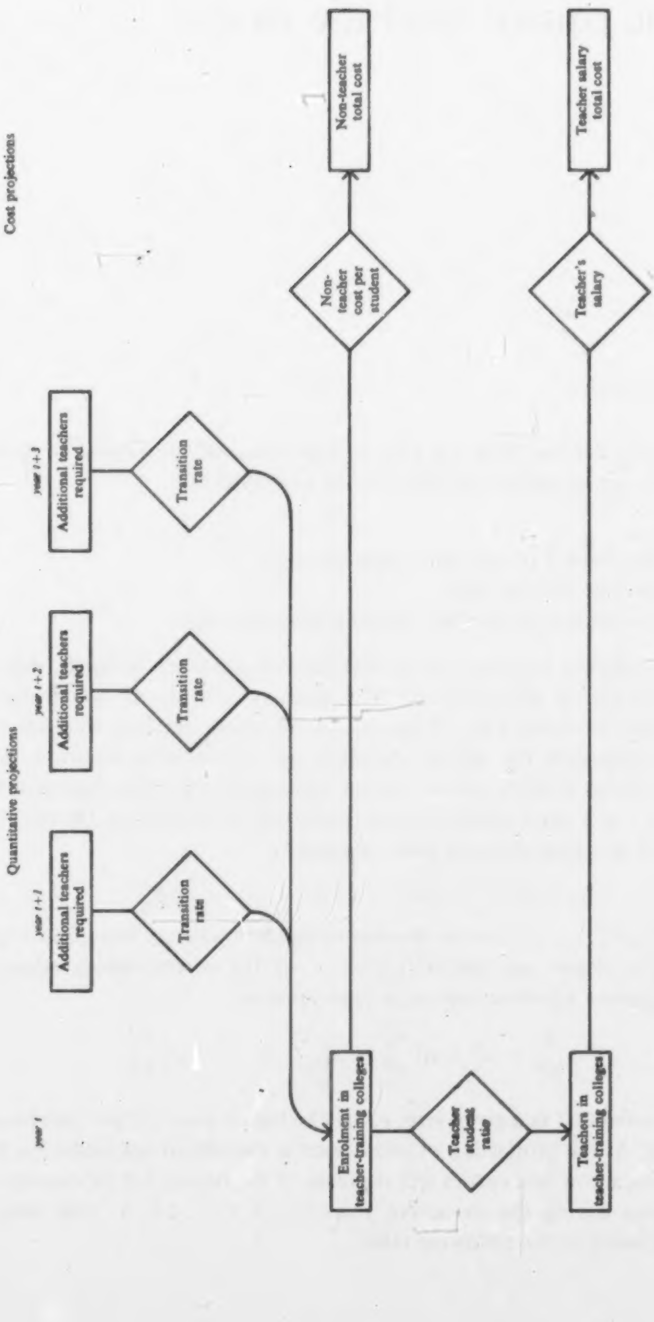
Quantitative projections
Cost projections
year t
year t+1
year t+2
year t+3
Additional teachers required
Additional teachers required
Additional teachers required
Transition rate
Transition rate
Transition rate
Enrolment in teacher-training colleges
Teacher student ratio
Teachers in teacher-training colleges
Non-teacher cost per student
Non-teacher total cost
Teacher's salary
Teacher salary total cost

FIGURE 3. *The functioning of the model: (c) projection of recurrent cost of teacher training*

I. Basic equations of the model

New admissions

New admissions depend upon the rate of admission and the number of children who reach the age of admission. This may be expressed as

$$A_t = a_t N_t$$

where A_t is the number of new admissions in year t

a_t is the rate of admission

and N_t is the number of children reaching admission age.

In some countries, however, many children are admitted although they are older than the official admission age. This phenomenon of late entries may be analysed in the following way. If late entries are those children who are from 1 to x years older than the official admission age, new admissions are made up of $(x+1)$ cohorts of children (those who are admitted at the official age and those who are from 1 to x years older than the official age of admission). On this basis, the number of new admissions in year t is equal to

$$A_t = a_t^0 N_t^0 + a_t^1 N_t^1 + a_t^2 N_t^2 + \dots + a_t^x N_t^x$$

where $N_t^0, N_t^1, N_t^2, \dots N_t^x$ are the number of children who are from 0 to x years older than the official age and $a_t^0, a_t^1, a_t^2, \dots a_t^x$ the corresponding admission rates. The apparent admission rate a_t is then equal to

$$a_t = \frac{A_t}{N_t^0} = a_t^0 + a_t^1 \frac{N_t^1}{N_t^0} + a_t^2 \frac{N_t^2}{N_t^0} + \dots + a_t^x \frac{N_t^x}{N_t^0}.$$

It is to be noted that in a given year, a_t may be higher than 100 per cent because of late entries. As the proportion of admissions at the official age increases, however, the occurence of late entries will decrease in the future. Let us consider the new admissions during the successive years, $t, t+1, \dots t+x$. They may be presented as shown in the following table.

Years	Children admitted at the official age of admission	Children admitted 1 year after the official age of admission		Children admitted x years after the official age of admission	Total admissions
t	$a_t^0\, N_t^0$	$a_t^1\, N_t^1$	. . .	$a_t^x\, N_t^x$	A_t
$t+1$	$a_{t+1}^0\, N_{t+1}^0$	$a_{t+1}^1\, N_{t+1}^1$	. . .	$a_{t+1}^x\, N_{t+1}^x$	A_{t+1}
. . .	. . .	. . .	. . .	. . .	. . .
$t+x$	$a_{t+x}^0\, N_{t+x}^0$	$a_{t+x}^1\, N_{t+x}^1$	. . .	$a_{t+x}^x\, N_{t+x}^x$	A_{t+x}

It can be seen immediately that $N_t^0, N_{t+1}^1, \ldots N_{t+x}^x$ are children who belong to the same cohort. As a result, if the apparent rate of admission

$$a_t = \frac{A_t}{N_t^0} = a_t^0 + a_t^1 \frac{N_t^1}{N_t^0} + \ldots + a_t^x \frac{N_t^x}{N_t^0}$$

can be higher than 100 per cent, $a_t^0 + a_{t+1}^1 + \ldots + a_{t+x}^x$ is at the maximum equal to 100 per cent. These rates are related to the same cohort of children and obviously the number of the children of the cohort who are successively admitted to school cannot be higher than the total number of children of the cohort. In other words, as the proportion of the children admitted at the official age a_t^0 increases, the rate $a_{t+1}^1, a_{t+2}^2, \ldots a_{t+x}^x$ will decrease in the future. This means that although at a certain stage of development of first-level education the apparent rate of admission may temporarily be higher than 100 per cent, in the long run, with a higher concentration of children admitted around the official admission age, the apparent rate will decrease and reach 100 per cent and the curve of new admissions will follow that for children reaching the official admission age.

If the number of children reaching the official admission age is constant and if the effect of mortality (which is relatively unimportant for this age group) is ignored, then

$$N_t^0 = N_t^1 = N_t^2 = \ldots = N_t^x$$

and

$$a_t = a_t^0 + a_t^1 + a_t^2 + \ldots + a_t^x.$$

If the number of children reaching the official age of admission increases at a constant rate α, and if the effect of mortality is again ignored

$$N_t^0 = (1+\alpha) N_t^1 = (1+\alpha)^2 N_t^2 = (1+\alpha)^x N_t^x.$$

As a result

$$a_t = a_t^0 + \frac{a_t^1}{(1+\alpha)} + \frac{a_t^2}{(1+\alpha)^2} + \ldots + \frac{a_t^x}{(1+\alpha)^x}.$$

EQUATION 1

$$A_t = a_t N_t$$

with

$$a_t = a_t^0 + a_t^1 + \ldots + a_t^x \text{ if } N_t \text{ is constant}$$

$$a_t = a_t^0 + \frac{a_t^1}{(1+\alpha)} + \ldots + \frac{a_t^x}{(1+\alpha)^x} \text{ if } N_t \text{ increases at constant rate } \alpha$$

$$a_t = a_t^0 + a_t^1 \frac{N_t^1}{N_t^0} + a_t^2 \frac{N_t^2}{N_t^0} + \ldots + a_t^x \frac{N_t^x}{N_t^0} \text{ in the general case.}$$

Total enrolment in first-level education

If the official length of first-level education is y years and if the maximum number of repetitions permitted is z, total enrolment in first-level education in year t is equal to the number of new admissions during year t plus what remains of the n cohorts of children ($n = y + z - 1$) who are admitted during the n preceding years. If we define the retention rates as being the proportion $b_1, b_2, \ldots b_n$ of the children who remain in the system one year, two years, ... n years after their admission into the system, total enrolment in first-level education during year t is equal to

$$E_t = A_t + b_1 A_{t-1} + b_2 A_{t-2} + \ldots + b_n A_{t-n}$$

where E_t is total enrolment,

$b_1, b_2, \ldots b_n$ the retention rates 1, 2, ... n years after admission,

and $A_t, A_{t-1}, \ldots A_{t-n}$ the number of new admissions during the years $t, t-1, \ldots t-n$.

Relating E_t to A_t, then

$$B_t = \frac{E_t}{A_t} = 1 + b_1 \frac{A_{t-1}}{A_t} + b_2 \frac{A_{t-2}}{A_t} + \ldots + b_n \frac{A_{t-n}}{A_t}$$

It can readily be seen that B_t depends upon $b_1, b_2, \ldots b_n$, but it also depends upon the growth of admissions in the past.

Retention rates and average length of schooling

If we follow one cohort A_t from year t, (the first year when they are admitted to school) to year $t + n$, (the last year where certain members of the cohort are still in the system), we can observe that the behaviour of the cohort in the system is as follows:

Years	Members of the cohort who are still in the system
t	A_t
$t+1$	$b_1 A_t$
$t+2$	$b_2 A_t$
...	...
$t+n$	$b_n A_t$

The total number of pupil years provided to the cohort A_t is equal to $(1+b_1+b_2+\ldots+b_n)\,A_t$ and the average length of schooling of each member of the cohort is equal to

$$L_t = 1 + b_1 + b_2 + \ldots b_n.$$

But we know that

$$B_t = \frac{E_t}{A_t} = 1 + b_1\frac{A_{t-1}}{A_t} + b_2\frac{A_{t-2}}{A_t} + \ldots + b_n\frac{A_{t-n}}{A_t}.$$

If the number of new admissions is constant, $A_t = A_{t-1} = A_{t-2} \ldots = A_{t-n}$ and $B_t = L_t$.

In general, however, B_t depends upon both the value of L_t, the average length of schooling and upon the rate of growth of the number of new admissions in the past.

Let us put $B_t = H_t L_t$.

H_t is then equal to

$$H_t = \frac{1 + b_1\dfrac{A_{t-1}}{A_t} + b_2\dfrac{A_{t-2}}{A_t} + \ldots + b_n\dfrac{A_{t-n}}{A_t}}{1 + b_1 + b_2 + \ldots + b_n}$$

It can be readily seen that H_t is inferior to 1 if the number of new admissions has been increasing in the past

H_t is equal to 1 if the number of new admissions has been constant and H_t is superior to 1 if the number of new admissions has been decreasing.

It is useful to isolate H_t and L_t. The latter is equal to the average length of schooling and depends only upon the retention rates. A change in the retention rate has a direct effect upon L_t and this change may be measured by comparing the value of L_t for two different years. H_t on the other hand, depends upon the increase in the number of new admissions in the past.

EQUATION 2

$$E_t = H_t \, L_t \, A_t$$

with

$$L_t = 1 + b_1 + b_2 + \ldots + b_n$$

and $H_t = 1$ if new admissions were constant

$$H_t = \frac{1 + \dfrac{b_1}{1+\beta} + \dfrac{b_2}{(1+\beta)^2} + \ldots + \dfrac{b_n}{(1+\beta)^n}}{1 + b_1 + b_2 + \ldots + b_n}$$

if admissions have been increasing at a constant rate β

$$H_t = \frac{1 + b_1 \dfrac{A_{t-1}}{A_t} + b_2 \dfrac{A_{t-2}}{A_t} + \ldots + b_n \dfrac{A_{t-n}}{A_t}}{1 + b_1 + b_2 + \ldots + b_n}$$ in the general case.

Enrolment by grade

When, according to the staffing formula, there are different types of teachers for different grades, or when the teacher/pupil ratio is different according to the grade, it may be necessary to estimate separately the enrolment for each grade.

If the maximum number of repetitions permitted during first-level schooling is two, the enrolment of a specific grade is made up of children of three cohorts —those who have not repeated, those who have repeated once and those who have repeated twice. The enrolment of the various grades in year t may be schematically presented in the following table.

Year of admission	Grade 1	Grade 2	Grade 3	...	Grade y
t	$b_0^1 A_t$				
$t-1$	$b_1^1 A_{t-1}$	$b_0^2 A_{t-1}$			
$t-2$	$b_2^1 A_{t-2}$	$b_1^2 A_{t-2}$	$b_0^3 A_{t-2}$		
$t-3$		$b_2^2 A_{t-3}$	$b_1^3 A_{t-3}$	...	
$t-4$			$b_2^3 A_{t-4}$	...	
...				...	
$t-(y-1)$					$b_0^y A_{t-(y-1)}$
$t-y$					$b_1^y A_{t-y}$
$t-(y+1)$					$b_2^y A_{t-(y+1)}$

It can be readily seen that $b_0^1, b_0^2, b_0^3, \ldots b_0^y$ are the proportions of a cohort reaching grade $1, 2, \ldots y$ without any repetition, that $b_1^1, b_1^2, b_1^3, \ldots b_1^y$ and $b_2^1, b_2^2, b_2^3, \ldots b_2^y$ are the proportions of a cohort reaching grade $1, 2, \ldots y$ with respectively one and two repetitions.

Total enrolment in one grade, grade y for instance, is equal to

$$E_t^y = b_0^y A_{t-(y-1)} + b_1^y A_{t-y} + b_2^y A_{t-(y+1)}.$$

In the same way as we have done for total enrolments, we can relate the enrolment of a specific grade in year t, to the new admissions during year t. Then,

$$B_t^y = \frac{E_t^y}{A_t} = b_0^y \frac{A_{t-(y-1)}}{A_t} + b_1^y \frac{A_{t-y}}{A_t} + b_2^y \frac{A_{t-(y+1)}}{A_t}.$$

B_t^y depends upon b_0^y, b_1^y and b_2^y but it also depends upon the growth in admissions in the past.

If we follow a cohort admitted into the system in year t and if we try to identify the members of this cohort who reach grade y, we see that a proportion b_0^y are in grade y in year $t + (y-1)$, a proportion b_1^y in year $t + y$ and a proportion b_2^y in year $t + y + 1$. The average length of time spent by a member of a cohort in grade y is therefore equal to

$$L_t^y = b_0^y + b_1^y + b_2^y.$$

As we have already done for total enrolment, we can put

$$H_t^y = \frac{B_t^y}{L_t^y} = \frac{b_0^y \frac{A_{t-(y-1)}}{A_t} + b_1^y \frac{A_{t-y}}{A_t} + b_2^y \frac{A_{t-(y+1)}}{A_t}}{b_0^y + b_1^y + b_2^y}.$$

EQUATION 2A

$$E_t^y = H_t^y L_t^y A_t$$

where $L_t^y = b_0^y + b_1^y + b_2^y$ if the maximum number of repetitions permitted is 2

and $H_t^y = 1$ if the number of new admissions remains constant

$$H_t^y = \frac{\dfrac{b_0^y}{(1+\beta)^{y-1}} + \dfrac{b_1^y}{(1+\beta)^y} + \dfrac{b_2^y}{(1+\beta)^{y+1}}}{b_0^y + b_1^y + b_2^y}$$

if the number of new admissions increases at the constant rate, β

and $$H_t^y = \frac{b_0^y \frac{A_{t-(y-1)}}{A_t} + b_1^y \frac{A_{t-y}}{A_t} + b_2^y \frac{A_{t-(y+1)}}{A_t}}{b_0^y + b_1^y + b_2^y}$$

in the general case.

Estimating retention rates

The methods of estimating retention rates depend upon the system of promotion and of selection and upon the statistical data available. One method is given in the appendix.

Number of teachers required

If i_t is the teacher/pupil ratio of year t, the number of teachers required is equal to

$$T_t = i_t E_t.$$

i_t depends, however, upon many factors. It depends upon the staffing formula which may provide for different types of teachers. It depends upon the average enrolment by class in the various grades.

Let us suppose that there are two types of teachers, type F and type G, and that the distribution of teachers by grade is as given in the following table.

	Grade 1	Grade 2	...	Grade y	Total
Type F teachers	F_t^1	F_t^2	...	F_t^y	F_t
Type G teachers	G_t^1	G_t^2	...	G_t^y	G_t
Total enrolment	E_t^1	E_t^2	...	E_t^y	E_t
Teacher/pupil ratio type F	$f_t^1 = \frac{F_t^1}{E_t^1}$	$f_t^2 = \frac{F_t^2}{E_t^2}$	...	$f_t^y = \frac{F_t^y}{E_t^y}$	$f_t = \frac{F_t}{E_t}$
Teacher/pupil ratio type G	$g_t^1 = \frac{G_t^1}{E_t^1}$	$g_t^2 = \frac{G_t^2}{E_t^2}$	...	$g_t^y = \frac{G_t^y}{E_t^y}$	$g_t = \frac{G_t}{E_t}$
Average teacher/ pupil ratio	$i_t^1 = f_t^1 + g_t^1$	$i_t^2 = f_t^2 + g_t^2$	...	$i_t^y = f_t^y + g_t^y$	$i_t = f_t + g_t$

It will be noted that

$$F_t = f_t E_t = f_t^1 E_t^1 + f_t^2 E_t^2 + \ldots + f_t^y E_t^y$$

and

$$f_t = f_t^1 \frac{E_t^1}{E_t} + f_t^2 \frac{E_t^2}{E_t} + \ldots + f_t^y \frac{E_t^y}{E_t}$$

f_t depends therefore upon the teacher/pupil ratio by grade and the structure of enrolment by grade.

Similarly,

$$g_t = g_t^1 \frac{E_t^1}{E_t} + g_t^2 \frac{E_t^2}{E_t} + \ldots + g_t^y \frac{E_t^y}{E_t}.$$

EQUATION 3

$$F_t = f_t E_t$$

where $$f_t = f_t^1 \frac{E_t^1}{E_t} + f_t^2 \frac{E_t^2}{E_t} + \ldots + f_t^\gamma \frac{E_t^\gamma}{E_t}.$$

$$G_t = g_t E_t$$

where $$g_t = g_t^1 \frac{E_t^1}{E_t} + g_t^2 \frac{E_t^2}{E_t} + \ldots + g_t^\gamma \frac{E_t^\gamma}{E_t};$$

and $$T_t = F_t + G_t = (f_t + g_t) E_t = i_t E_t.$$

As the teachers of type F and type G have different qualifications and training and probably different salary scales, it may be useful to show the proportion of teachers of each of these types. A change in the qualification profile of the teaching force during a given period will change these proportions and consequently the average salary of teachers.

If p_t^f is the proportion of teachers of type F

then $$p_t^f = \frac{F_t}{T_t}$$

and $$F_t = p_t^f T_t = p_t^f i_t E_t$$

similarly $$G_t = p_t^g i_t E_t.$$

EQUATION 3A

$$T_t = i_t E_t$$

$$F_t = p_t^f i_t E_t$$

$$G_t = p_t^g i_t E_t$$

Additional number of teachers

The additional number of teachers required at the end of year t, T_t, is equal to the stock of teachers required during $t + 1$, minus the stock of teachers of year t who are still in service in the year $t + 1$.

$$\Delta T_t = T_{t+1} - T_t(1 - \lambda_t),$$

λ_t being the wastage rate of teachers.

If confined to type F teachers, then

$$\Delta F_t = F_{t+1} - F_t(1-\lambda_t)$$

Thus by putting F_t in factor form

$$\Delta F_t = F_t\left[\frac{F_{t+1}}{F_t} - (1-\lambda_t)\right].$$

Let us compute first $\frac{F_{t+1}}{F_t}$. Using equations 2 and 3A, this may be expressed as follows:

$$\frac{F_{t+1}}{F_t} = \frac{p^f_{t+1}\, i_{t+1}\, L_{t+1}\, H_{t+1}\, A_{t+1}}{p^f_t\, i_t\, L_t\, H_t\, A_t}.$$

where

$\frac{p^f_{t+1}}{p^f_t}$	represents the change in the percentage of type F teachers from year t to year $t+1$
$\frac{i_{t+1}}{i_t}$	the change in the teacher/pupil ratio
$\frac{L_{t+1}}{L_t}$	the change in the average length of schooling
$\frac{H_{t+1}}{H_t}$	the change in the trend of new admissions during the two periods, $t-n$ to t and $t-(n+1)$ to $t+1$.

Let us isolate these four factors and put

$$1 + \delta^f_t = \frac{p^f_{t+1}\, i_{t+1}\, L_{t+1}\, H_{t+1}}{p^f_t\, i_t\, L_t\, H_t}.$$

If the rate of growth of admissions from year t to year $t+1$ is β, we have

$$\frac{F_{t+1}}{F_t} = (1+\delta^f_t)(1+\beta_t).$$

and as δ_t and β_t are small

$$\frac{F_{t+1}}{F_t} \simeq (1+\delta^f_t+\beta_t)$$

and

$$\Delta F_t = F_t\left[\frac{F_{t+1}}{F_t} - (1-\lambda_t)\right]$$

$$= F_t[1+\delta^f_t+\beta_t-1+\lambda_t] = F_t(\delta^f_t+\beta_t+\lambda_t).$$

The additional number of type *F* teachers depends therefore upon:

F_t stock of type *F* teachers;
λ_t wastage rate of teachers;
β_t rate of growth of new admissions;
δ_t^f which depends upon the change from year t to year $t+1$ of the qualification profile of the teaching force, the teacher/pupil ratio and the retention rates of the system.

Similarly $$\Delta G_t = G_t(1 + \delta_t^g + \beta_t + \lambda_t).$$

EQUATION 4

$$\Delta F_t = F_t(\delta_t^f + \beta_t + \lambda_t)$$

$$\Delta G_t = G_t(\delta_t^g + \beta_t + \lambda_t)$$

where $$\delta_t^f = \frac{p_{t+1}^f \, i_{t+1} \, L_{t+1} \, H_{t+1}}{p_t^f \, i_t \, L_t \, H_t};$$

$$\delta_t^g = \frac{p_{t+1}^g \, i_{t+1} \, L_{t+1} \, H_{t+1}}{p_t^g \, i_t \, L_t \, H_t};$$

$$\beta_t = \frac{A_{t+1}}{A_t};$$

and λ_t is the wastage rate of teachers.

Enrolment in teacher training

If the training of type *F* teachers lasts three years, enrolments in teacher-training colleges depend upon the additional number of teachers required at the end of year t, year $t+1$ and year $t+2$; in other words, according to what has been shown previously upon ΔF_t, ΔF_{t+1} and ΔF_{t+2}.

If j_1^f, j_2^f and j_3^f are respectively the ratios between enrolments in the first, second and third grades of teacher-training colleges, and the number of graduates who enter the teaching force in three years' time, in two years' time and at the end of the current year, total enrolments of type *F* teacher-training colleges are equal to

$$J_t^f = j_1^f \, \Delta F_{t+2} + j_2^f \, \Delta F_{t+1} + j_3^f \, \Delta F_t .$$

Putting ΔF_t in factor form, this may be expressed as

$$J_t^f = \Delta F_t \left(j_1^f \frac{\Delta F_{t+2}}{\Delta F_t} + j_2^f \frac{\Delta F_{t+1}}{\Delta F_t} + j_3^f \right)$$

since, as shown earlier

$$\begin{aligned} \Delta F_t &= F_t(\delta^f_t + \beta_t + \lambda_t); \\ \Delta F_{t+1} &= F_{t+1}(\delta^f_{t+1} + \beta_{t+1} + \lambda_{t+1}); \\ \Delta F_{t+2} &= F_{t+2}(\delta^f_{t+2} + \beta_{t+2} + \lambda_{t+2}); \end{aligned}$$

and since

$$\frac{F_{t+1}}{F_t} = 1 + \delta^f_t + \beta_t;$$

$$\frac{F_{t+2}}{F_{t+1}} = 1 + \delta^f_{t+1} + \beta_{t+1}.$$

If δ^f, β and λ do not change significantly during a three year period, it may be seen that

$$\frac{\Delta F_{t+1}}{\Delta F_t} \simeq 1 + \delta^f_t + \beta_t.$$

and

$$\frac{\Delta F_{t+2}}{\Delta F_t} \simeq (1 + \delta^f_t + \beta_t)^2.$$

Thus total enrolment is equal to

$$J^f_t \simeq \Delta F_t \left[j^f_1 (1 + \delta^f_t + \beta_t)^2 + j^f_2 (1 + \delta^f_t + \beta_t) + j^f_3 \right].$$

Putting

$$j^f_t = j^f_1 (1 + \delta^f_t + \beta_t)^2 + j^f_2 (1 + \delta^f_t + \beta_t) + j^f_3.$$

Then

$$J^f_t \simeq j^f_t \, \Delta F_t.$$

Similarly

$$J^g_t \simeq j^f_t \, \Delta G_t.$$

EQUATION 5

$$\begin{aligned} J^f_t &= j^f_t \, \Delta F_t \\ J^g_t &= j^g_t \, \Delta G_t \end{aligned}$$

where

$$\begin{aligned} j^f_t &= j^f_1 (1 + \delta^f_t + \beta_t)^2 + j^f_2 (1 + \delta^f_t + \beta_t) + j^f_3 \\ j^g_t &= j^g_1 (1 + \delta^g_t + \beta_t)^2 + j^g_2 (1 + \delta^g_t + \beta_t) + j^g_3. \end{aligned}$$

Number of new classrooms required

The number of new classrooms required in year t is equal to the increase in the number of classrooms from year t to year $t + 1$ to which is added the number of classrooms to be replaced. This can be expressed as

$$\Delta K_t = K_{t+1} - K_t + Q_t$$

where K_{t+1} and K_t are the number of classrooms required in year $t + 1$ and year t, and Q_t is the number of classrooms to be replaced during year t.

Putting K_t in factor form, we then have

$$\Delta K_t = K_t\left(\frac{K_{t+1}}{K_t} - 1 + \frac{Q_t}{K_t}\right).$$

If k_t and k_{t+1} are the classroom/pupil ratios for year t and year $t + 1$, then

$$K_t = k_t E_t$$

and

$$K_{t+1} = k_{t+1} E_{t+1}$$

$$\frac{K_{t+1}}{K_t} = \frac{k_{t+1} E_{t+1}}{k_t E_t}.$$

Thus, using equation 2

$$\frac{K_{t+1}}{K_t} = \frac{k_{t+1} L_{t+1} H_{t+1} A_{t+1}}{k_t L_t H_t A_t}.$$

As we have done previously, let us put

$$1 + v_t = \frac{k_{t+1} L_{t+1} H_{t+1}}{k_t L_t H_t}.$$

$1 + v_t$ depends upon the change from year t to year $t + 1$ in the classroom/pupil ratio, in the average length of schooling and in the trend of new admissions during the periods, from year $t - n$ to year t and from year $t - n + 1$ to year $t + 1$.

Consequently,

$$\frac{K_{t+1}}{K_t} = (1 + v_t)(1 + \beta_t) \simeq 1 + v_t + \beta_t$$

if β_t and v_t are small.

If the percentage of classrooms to be replaced is $\rho_t = \dfrac{Q_t}{K_t}$, then

$$\begin{aligned}\Delta K_t &= K_t(1+v_t+\beta_t-1+\rho_t)\\ &= K_t(v_t+\beta_t+\rho_t)\end{aligned}$$

EQUATION 6

$$\Delta K_t = (v_t+\beta_t+\rho_t)\,k_t\,E_t$$

k_t is the classroom/pupil ratio;

ρ_t the percentage of classrooms to be replaced;

β_t the rate of growth of new admissions;

and $$1 + v_t = \frac{k_{t+1}\,L_{t+1}\,H_{t+1}}{k_t\,L_t\,H_t}.$$

Recurrent costs of first-level education

The recurrent costs of first-level education may be subdivided into two broad categories, salary costs and non-salary costs. The non-salary costs may include teaching materials, school supplies, maintenance costs and social costs such as canteens, boarding costs, etc.

$$C_t = S_t + M_t$$

where C_t = total recurrent costs;
S_t = salary costs;
M_t = non-salary costs.

If s_t^f and s_t^g are respectively the average salary cost of type F and type G teachers, then

$$S_t = s_t^f\,F_t + s_t^g\,G_t.$$

Thus, using equation 3A

$$S_t = (s_t^f\,p_t^f + s_t^g\,p_t^g)\,i_t\,E_t.$$

If there are only two categories of teachers, then $p_t^f + p_t^g = 1$ and putting s_t^f in factor form, we have

$$S_t = s_t^f\left[p_t^f + \frac{s_t^g}{s_t^f}(1-p_t^f)\right]i_t\,E_t.$$

Let us put

$$p_t^f + \frac{s_t^g}{s_t^f}(1 - p_t^f) = \theta_t.$$

θ_t is a coefficient which depends upon the qualification profile of the teaching force (represented here by the percentage p_t^f of type *F* teachers and the percentage $1 - p_t^f$ of type *G* teachers) and upon the differences between the average salaries of the various types of teachers (represented here by the ratio between the average salary of type *F* and type *G* teachers).

If m_t is the non-salary unit cost, then

$$M_t = m_t E_t.$$

The total recurrent cost $C_t = S_t + M_t$ can also be put in the form: $C_t = S_t\left(1 + \frac{M_t}{S_t}\right)$. This expression is convenient in the comparison of two different years, for it gives the effect of a change in the ratio of non-salary cost as compared to salary cost.

Finally then

$$C_t = s_t^f \theta_t i_t E_t \left(1 + \frac{M_t}{S_t}\right).$$

EQUATION 7

$$C_t = s_t^f \theta_t i_t E_t \left(1 + \frac{M_t}{S_t}\right)$$

where s_t^f is the average salaries of teachers of type *F*, say the most qualified type;

θ_t is a coefficient which depends upon the qualification profile of the teaching force and the differences in average salaries of the various types of teachers;

$\frac{M_t}{S_t}$ is the ratio between non-salary costs and salary costs.

Capital cost of first-level education

If there are three types of school building, types *A*, *B*, and *C*, and if during year *t*, the average building cost of a classroom of each of these types is v_t^a, v_t^b, v_t^c and that their proportion is q_t^a, q_t^b and q_t^c the total capital cost V_t is equal to

$$V_t = (v_t^a q_t^a + v_t^b q_t^b + v_t^c q_t^c)\,\Delta K_t.$$

EQUATION 8

$$V_t = (v_t^a q_t^a + v_t^b q_t^b + v_t^c q_t^c)\,\Delta K_t$$

where v_t^a, v_t^b, v_t^c are the average building costs of a classroom of types A, B and C

and q_t^a, q_t^b, q_t^c are the proportions of the types of classrooms to be built.

Recurrent cost of teacher training

As for the recurrent cost of first-level education, in the total cost of teacher training P_t, we will distinguish between salary cost W_t and non-salary cost U_t.

$$P_t = W_t + U_t$$

or, if we want to separate the training cost for type F and for type G teachers

$$P_t = P_t^f + P_t^g$$

$$P_t^f = W_t^f + U_t^f$$

$$P_t^g = W_t^g + U_t^g.$$

Let us consider first the training cost of type F teachers. If the teacher/student ratio is d_t^f and if the average salary is w_t^f, then

$$W_t^f = w_t^f d_t^f J_t^f.$$

Furthermore, if the non-salary unit cost of teacher training is u_t^f then

$$U_t^f = u_t^f J_t^f.$$

Finally then

$$P_t^f = W_t^f + U_t^f = (w_t^f d_t^f + u_t^f) J_t^f.$$

Similarly

$$P_t^g = W_t^g + U_t^g = (w_t^g d_t^g + u_t^g) J_t^g.$$

EQUATION 9

$$P_t = P_t^f + P_t^g$$

$$P_t^f = (w_t^f d_t^f + u_t^f) J_t^f$$

$$P_t^g = (w_t^g d_t^g + u_t^g) J_t^g$$

where w_t^f and w_t^g are the average salaries of teachers in type F and type G teacher-training colleges;

d_t^f and d_t^g are the teacher/student ratios for these colleges;

u_t^f and u_t^g are the non-salary unit costs of these colleges;

and J_t^f and J_t^g are the enrolments of these colleges.

Recapitulation of the equations and of the variables

Endogenous variables	Policy variables	Exogenous variables
EQUATION 1: $A_t = a_t N_t$		
A_t = total admissions	a_t = apparent rate of admission	N_t = admission age population
EQUATION 2: $E_t = H_t L_t A_t$		
E_t = total enrolment H_t = coefficient depending upon the trend of new admissions from year $t-n$ to year t	L_t = average length of first-level schooling	
EQUATION 3: $F_t = f_t E_t$ $G_t = g_t E_t$ $T_t = F_t + G_t = i_t E_t$		
F_t = type F teachers	f_t = type F teacher/pupil ratio	
G_t = type G teachers	g_t = type G teacher/pupil ratio	
T_t = total number of teachers	i_t = average teacher/pupil ratio	

Endogenous variables	Policy variables	Exogenous variables
EQUATION 4: $\Delta F_t = F_t(\delta_t^f + \beta_t + \lambda_t)$ $\Delta G_t = G_t(\delta_t^g + \beta_t + \lambda_t)$		
ΔF_t = annual increase of the stock of type F teachers ΔG_t = annual increase of the stock of type G teachers δ_t^f and δ_t^g = rate depending upon the change from year t to year $t+1$ of f_t, g_t, H_t and L_t	β_t = rate of increase of new admissions from year t to year $t+1$	λ_t = wastage rate of teachers
EQUATION 5: $J_t^f = [j_1^f(1+\delta_t^f+\beta_t)^2 + j_2^f(1+\delta_t^f+\beta_t) + j_3^f]\,\Delta F_t$ in the hypothesis where the training of teachers lasts three years.		
J_t^f = enrolment in type F teacher-training colleges	j_1^f = proportion of the 1st year students who enter the teaching force 3 years later. j_2^f = proportion of the 2nd year students who enter the teaching force 2 years later. j_3^f = proportion of the 3rd year students who enter the teaching force the following year.	
EQUATION 6: $\Delta K_t = (v_t\, \beta_t\, \rho_t)\, k_t E_t$		
ΔK_t = number of additional classrooms to be built v_t = rate depending upon the change from year t to year $t+1$ of k_t, L_t and H_t	k_t = classroom/pupil ratio	ρ_t = proportion of classrooms to be replaced
EQUATION 7: $C_t = s_t^f\, \theta_t\, i_t\, E_t\left(1 + \frac{M_t}{S_t}\right)$		
C_t = recurrent cost of first-level education	θ_t = coefficient depending upon the qualification profile of teachers and the difference in average salaries $\frac{M_t}{S_t}$ = non-salary cost/salary cost ratio	s_t^f = average salary of type F teachers

Endogenous variables	Policy variables	Exogenous variables
EQUATION 8: $V_t = (v_t^a q_t^a + v_t^b q_t^b + v_t^c q_t^c)\,\Delta K_t$		
V_t = capital cost of first-level education		v_t^a, v_t^b, v_t^c average building cost of type *A*, *B*, *C* classrooms to be built q_t^a, q_t^b, q_t^c proportion of type *A*, *B*, *C* classrooms to be built
EQUATION 9: $P_t = (w_t^f d_t^f + u_t^f)\,J_t^f + (w_t^g d_t^g + u_t^g)\,J_t^g$		
P_t = recurrent cost of teacher-training colleges	d_t^f and d_t^g teacher/student ratio of type *F* and type *G* teacher-training colleges	w_t^f and w_t^g average salaries of teachers in type *F* and type *G* teacher-training colleges u_t^f and u_t^g non-salary unit cost of these colleges

II Change in the variables from the base year to the horizon year

As we have already said, the main aim of the model is to project a certain number of variables to year t, i.e. the horizon year. Various hypotheses and estimates are made about the trend of the endogenous variables, the policy variables and the exogenous variables, taking into account their value in the base year. But the model also aims at comparing the situation in the horizon year to that in the base year and showing the relative effect of each of the policy variables and of each of the exogenous variables.

By way of illustration, here is how the model may be used to compare the number of new admissions, the total enrolment of first-level education and the recurrent cost of that education .

Change in the number of new admissions .

Using equation 1, we can express

$$A_0 = a_0 N_0$$

$$A_t = a_t N_t \, .$$

Consequently,

$$\frac{A_t}{A_0} = \frac{a_t}{a_0} \frac{N_t}{N_0} .$$

If a_0 is inferior to 100 per cent, i.e. if admission is not yet total, the increase of the rate of admission from year 0 to year t will lead to an increase in new admissions superior to the increase in the admission-age population. Conversely, if because of late entries, the admission rate of the base year is over 100 per cent, the reduction of late entries will result in an increase in the number of new admissions inferior to the increase of the admission-age population.

The following table gives the situation of Tanzania as compared to that of Ceylon:

Variables	Tanzania			Ceylon		
(Base year: 1968) (Horizon year: 1989)	I	II	III	I	II	III
$\frac{a_t}{a_0}$	2.110	2.110	2.110	0.906	0.906	0.906
$\frac{N_t}{N_0}$	1.758	1.900	2.036	0.981	1.350	1.641
$\frac{A_t}{A_0}$	3.709	4.009	4.295	0.889	1.223	1.486

I = low population assumption; II = medium population assumption; III = high population assumption

It is to be noted that the rapid increase of the admission rate combined with a rapid increase of the population in the three demographic assumptions will bring about a very high increase in the number of new admissions in Tanzania. The effect of the increase in the rate of admission is even greater than that of population growth. In Ceylon in the low demographic assumption, the reduction of late entries and the slight decrease of admission-age population will result in the number of admissions in 1989 being inferior to that of 1968.

Change in the total enrolment of first-level education

By using equation 2, we can express

$$E_0 = H_0 L_0 A_0$$

$$E_t = H_t L_t A_t$$

and consequently $$\frac{E_t}{E_0} = \frac{H_t}{H_0} \frac{L_t}{L_0} \frac{A_t}{A_0}.$$

As we have shown previously, H_t depends upon the trend of new admissions from year $t - n$ to year t ($n+1$ being the maximum length of first-level education, taking into account the number of repetitions permitted). It is equal to 1 if the number of new admissions is constant, inferior to 1 if the number of new admissions is increasing, and superior to 1 if the number of new admissions is decreasing.

Thus, $\frac{H_t}{H_0}$ depends upon the rate of increase of the number of new admissions during the two periods $t - n$ to t and $-n$ to 0. It depends consequently upon the rate of population growth.

$\frac{L_t}{L_0}$ depends upon the change in the average length of first-level education, i.e. upon the change of the retention rates in the system.

The following table again gives the comparative situations in Tanzania and in Ceylon.

Variables	Tanzania			Ceylon		
(base year: 1968 (horizon year: 1989)	I	II	III	I	II	III
$\frac{A_t}{A_0}$	3.709	4.009	4.295	0.889	1.223	1.486
H_t	0.829	0.821	0.814	1.038	0.975	0.938
H_0	0.926	0.926	0.926	0.897	0.897	0.897
$\frac{H_t}{H_0}$	0.895	0.887	0.879	1.157	1.087	1.046
L_t	6.600	6.600	5.600	7.200	7.200	7.200
L_0	5.165	5.165	5.165	6.400	6.400	6.400
$\frac{L_t}{L_0}$	1.278	1.278	1.278	1.124	1.124	1.124
$\frac{E_t}{E_0}$	4.242	4.544	4.825	1.156	1.494	1.747

I = low population assumption; II = medium population assumption; III = high population assumption

Note that H_t is smaller in the high demographic assumption than in the low assumption, for it depends upon the growth of the number of new admissions during the previous n years and the higher the growth of new admissions, the smaller H_t will be. In the low demographic assumption in Ceylon H_t is superior to 1. This means that the number of new admissions will be decreasing during the n years preceding 1989.

In Tanzania H_t is less than H_0 because the target of total admission in 1989 will lead to a more rapid increase of the number of new admissions during the n years preceding 1989 (i.e. from 1983 to 1989) than during the n years preceding 1968 (i.e. from 1962 to 1968). In the case of Ceylon it is the reverse.

Change in the recurrent costs of first-level education

By using equation 7, we can express

$$C_0 = s_0^f \theta_0 i_0 E_0 \left(1 + \frac{M_0}{S_0}\right)$$

$$C_t = s_t^f \theta_t i_t E_t \left(1 + \frac{M_t}{S_t}\right)$$

consequently

$$\frac{C_t}{C_0} = \frac{s_t^f \theta_t i_t E_t \; 1 + \dfrac{M_t}{S_t}}{s_0^f \theta_0 i_0 E_0 \; 1 + \dfrac{M_0}{S_0}}$$

furthermore, replacing E_t and E_0 by their values as given in Equation 2

$$\frac{C_t}{C_0} = \frac{s_t^f \theta_t i_t H_t L_t a_t N_t \; 1 + \dfrac{M_t}{S_t}}{s_0^f \theta_0 i_0 H_0 L_0 a_0 N_0 \; 1 + \dfrac{M_0}{S_0}}.$$

s_t^f and s_0^f are the average salary of one type of teacher. Thus $\frac{s_t^f}{s_0^f}$ shows the change in salary during the period.

θ_t and θ_0 are coefficients which depend upon the qualification profile of the teaching force and the difference in the average salaries of the various types of teachers. Thus,

$\frac{\theta_t}{\theta_0}$ represents the change in the qualification profile of the teaching force;

$\frac{i_t}{i_0}$ represents the change in the teacher/pupil ratio;

$\frac{H_t}{H_0}$ represents the change in the growth of the number of new admissions during the n years preceding year t and year 0;

$\frac{L_t}{L_0}$ represents the change in the average length of first-level education and thus the change in the retention rate of the system;

Variation 0 = 1968 t = 1989	Significance	Tanzania			Ceylon		
		I	II	III	I	II	III
$\frac{N_t}{N_0}$	Change in the admission-age population	1.758	1.900	2.036	0.981	1.350	1.641
$\frac{a_t}{a_0}$	Change in the retention rate	2.110	2.110	2.110	0.906	0.906	0.906
$\frac{L_t}{L_0}$	Change in the average length of schooling	1.278	1.278	1.278	1.124	1.124	1.124
$\frac{H_t}{H_0}$	Change in the rate of growth of the number of new admissions during the *n* years preceding year 0 and year *t*	0.895	0.887	0.8[illegible]	1.157	1.087	1.046
$\frac{i_t}{i_0}$	Change in the teacher/pupil ratio	1.275	1.272	1.268	1.186	1.186	1.186
$\frac{\theta_t}{\theta_0}$	Change in the qualification profile of the teaching force	1.147	1.133	1.129	1.109	1.109	1.109
$\frac{s_t^f}{s_0^f}$	Change in salaries	1.439	1.439	1.439	1.639	1.618	1.607
$1+\frac{M_t}{S_0}$	Change in total cost/salary cost ratio	0.862	0.862	0.862	1.067	1.069	1.071
$\frac{C_t}{C_0}$	Change in recurrent cost of first-level education	7.451	8.008	8.416	2.566	3.398	3.959

$\frac{a_t}{a_0}$ represents the change in the admission rate;

$\frac{N_t}{N_0}$ represents the change in the admission age population.

The value of these variables for Tanzania and for Ceylon is shown in the table opposite.

Appendix

Estimation of retention rates

If y is the official length of first-level education and z the total number of repetitions permitted, the distribution of pupils by grade and by number of repetitions may be schematically presented as shown in the following table.

Total number of repetitions during first-level schooling	Grade 1	Grade 2	Grade 3	...	Grade y
0	E_0^1	E_0^2	E_0^3	...	E_0^y
1	E_1^1	E_1^2	E_1^3	...	E_1^y
2	E_2^1	E_2^2	E_2^3	...	E_2^y
...	...	...	...	...	...
z	E_z^1	E_z^2	E_z^3		E_z^y

If this distribution was established for year t, it is clear that E_0^1 (pupils in grade 1 with no repetition) belong to cohort A_t. Similarly, E_0^2 (pupils in grade 2 with no repetition) and E_1^1 (pupils in grade 1 with 1 repetition) belong to cohort A_{t-1}. Similarly, E_0^3, E_1^2 and E_2^1 belong to cohort A_{t-2}, etc.

E_0^1 are the members of cohort A_t who remain in the system in year t, $E_0^2 + E_1^1$ are the members of cohort A_{t-1} who remain in the system in year t, etc.

By definition

$$b_0 = \frac{E_0^1}{A_t} = 1\,;$$

$$b_1 = \frac{E_0^2}{A_{t-1}} + \frac{E_1^1}{A_{t-1}}\,;$$

$$b_2 = \frac{E_0^3}{A_{t-2}} + \frac{E_1^2}{A_{t-2}} + \frac{E_2^1}{A_{t-2}}\,;$$

...

$$b_{n-2} = \frac{E_z^{y-2}}{A_{t-(n-2)}} + \frac{E_{z-1}^{y-1}}{A_{t-(n-2)}} + \frac{E_{z-2}^{y}}{A_{t-(n-2)}}\,;$$

$$b_{n-1} = \frac{E_z^{y-1}}{A_{t-(n-1)}} + \frac{E_{z-1}^{y}}{A_{t-(n-1)}}\,;$$

$$b_n = \frac{E_z^y}{A_{t-n}}\,.$$

It may be stated that $\frac{E_0^1}{A_t}, \frac{E_0^2}{A_{t-1}}, \frac{E_0^3}{A_{t-2}}, \frac{E_0^y}{A_{t-y+1}}$ are the proportions of children admitted during the years t, $t-1$, $t-2 \ldots t-y+1$ who reach in year t grades 1, 2, 3, ... y, i.e. without any year of repetition. We have previously called these proportions $b_0^1, b_0^2, b_0^3 \ldots b_0^y$.[1]

Similarly, $\frac{E_1^1}{A_{t-1}}, \frac{E_1^2}{A_{t-2}}, \frac{E_1^3}{A_{t-3}}, \ldots \frac{E_1^y}{A_{t-y}}$ are the proportions of children admitted in years $t-1$, $t-2$, $t-3 \ldots t-y$ who reach in year t grades 1, 2, 3 ... y i.e. with one year of repetition. We have called these proportions $b_1^1, b_1^2, b_1^3, \ldots b_1^y$.

With these definitions, the retentions rates can be expressed more simply.

$$b_0 = 1$$

$$b_1 = b_0^2 + b_1^1$$

$$b_2 = b_0^3 + b_1^2 + b_2^1$$

$$\ldots$$

$$b_{n-2} = b_{z-2}^y + b_{z-1}^{y-1} + b_z^{y-2}$$

$$b_n = b_z^y.$$

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[1] See p. 290-291

IIEP book list

The following books, published by Unesco:IIEP, are obtainable from the Institute or from Unesco and its national distributors throughout the world:

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Educational planning: a directory of training and research institutions (1968)

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New educational media in action: case studies for planners (1967. Three volumes)

The new media: memo to educational planners by W. Schramm, P.H. Coombs, F. Kahnert, J. Lyle (1967. A report including analytical conclusions based on the above three volumes of case studies)

Planning the development of universities—I (1971. Further volumes to appear)

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Published by Oxford University Press, New York, London and Toronto, 1972

Quantitative methods of educational planning by Héctor Correa
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The book

The relatively large size of the school-age population as a proportion of total population, and its rapid growth, mean that schooling in developing countries requires an effort proportionately much greater than that made by industrialized countries which have different population characteristics. Population growth, however, is not the sole factor in cost increase. It compounds the effect of other factors such as the increase of enrolment ratios, the need for a qualitative improvement in the educational system and the longterm trends of unit costs. This report, which includes four national case studies, tries to isolate each of these factors in order to bring out the effect of population growth on [illegible]

The authors

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